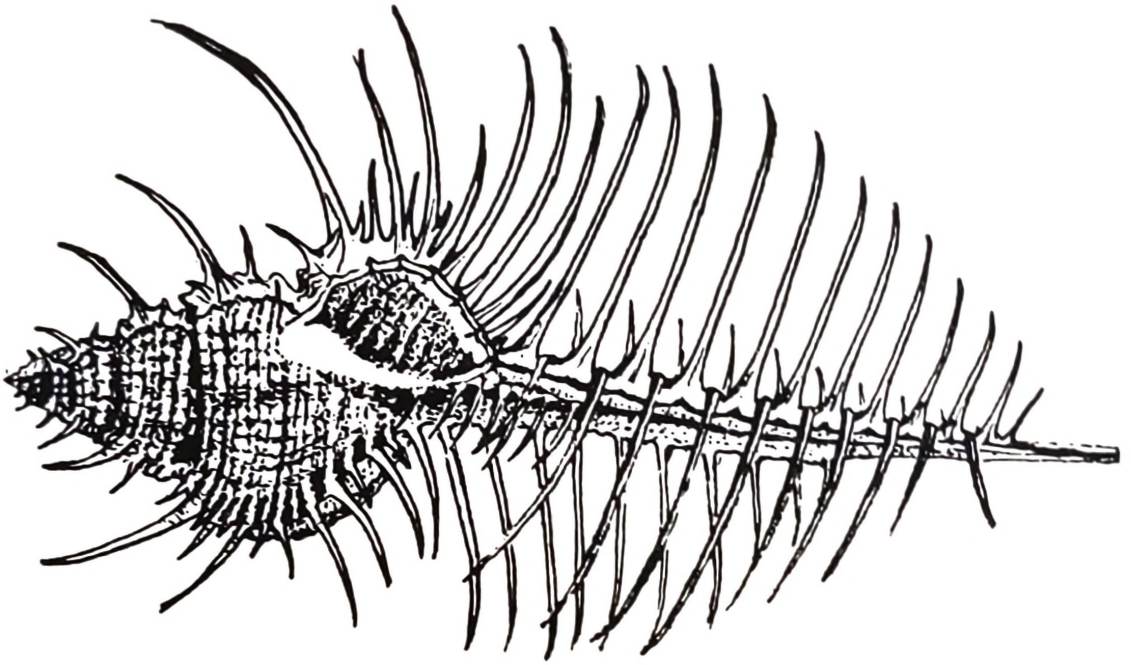
SEA SNAILS OF PONDICHERRY

FRED PINN



"There is nothing small in God's eye; let there be nothing small in thine. He bestows as much labour of divine energy on the formation of a shell as on the building of an empire."

Sri Aurobindo

SEA SNAILS OF PONDICHERRY

FRED PINN

NEHRU SCIENCE CENTRE
PONDICHERRY

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Nehru Science Centre,
Pondicherry.

Published : 1990

PRICE : Rs. Rs. 90

Designed & Printed by :
The Director, Directorate of Stationery and Printing,
Pondicherry, INDIA.

FOREWORD

The book "Sea Snails of Pondicherry" is the first publication of the Nehru Science Centre, Pondicherry. It is also the first ever publication on any aspect of the seashore of this locality.

The sea has many treasures to offer to mankind and a systematic study will help humanity not only in understanding about the wealth of the sea but also in preserving such wealth from being spoliated. With a view to create an awareness of the sea environment the setting up of a Shell section had been planned by the Museum for some time.

Fortunately, we had the opportunity of meeting Mr. Fred Pinn when he came to the Pondicherry Museum to buy our publications. A brief conversation with him revealed that one of his many interests is the study of sea shells. When we told him our plan of setting up a shell display, he readily agreed to take up the job in right earnest without any commitments, terms or conditions.

Every week he used to go to the Pondicherry beach early in the morning about the time when the fishermen would land their fishing catches. The fishermen would spread their nets and after taking out all fish and other saleable items they would leave the rest on the sand. From the piles of thrown-out "rubbish" Mr. Pinn then collected whatever useful shells he came across; with this collection he returned to his laboratory to begin the labour of sorting, soaking in water or formalin and general cleaning; sometimes shells would be heavily encrusted-which then required a lengthy process of careful brushing and removing all incrustations.

Sometimes the fishermen kept some rare shells on account of their beauty or unusual appearance. Such specimens were then offered to Mr. Pinn and after bargaining - some demands were rather inflated - were added to the collection; but he did not hesitate to pay what was asked for if the shells happened to be rare ones. His frequent visits to the beach earned him among the fisher folk the title of "Sanghu Thatta" (சங்கு தாத்தா).

After a year of intensive collecting the shells were sorted and identified. Two glass show-cases now display 120 of the over 200 species. Due to limited space it was decided to show sea snails (gastropods) only, though an extension is intended to contain all Pondicherry sea shells.

In order to enable the public, and particularly students, to understand the shell display it was felt necessary to bring out a "guide". Mr. Pinn, who has been responsible for putting up an attractive display in the two mentioned show-cases, was requested to write a

book based on the shell exhibits to which he readily agreed. After a year of hard work this "guide" has been completed. It gives a description of each shell and outlines its "family background" in vivid yet simple language together with the line drawings and colour illustrations; readers will have no difficulty in deriving a maximum of information.

Mr. Pinn's untiring work even at the age of 72 makes us realise that old age and one's retirement do not pose problems in achieving things if one has a will and ambition in life.

K. RAJARAM
Curator
NEHRU SCIENCE CENTRE
PONDICHERRY

ACKNOWLEDGEMENTS

Our thanks are due first and foremost to Mr. K. Rajaram, Curator of the Pondicherry Museum, for initiating the Shell display in the Museum and pressing, as a logical sequel, for a guide to go with the exhibits. Both are meant to be a contribution and stimulus to the study of Pondicherry's environment. His vision of future development of this subject and his drive can hardly be excelled and have been a great inspiration.

We are also indebted to the great encouragement given by Mr. F. Cyril Anthony (when Education Deputy Secretary) by way of proposing the highest standard of publication possible in order to make the book really attractive and useful.

But all our good intentions would have come to nothing without the approval and sanction of the whole project by the Director of Education, Mr. P. Mathew Samuel. He sees this guide as the beginning of a whole series of publications on the Natural History of Pondicherry. We tender him our thanks.

A list of silent and vocal supporters would be too long, but thankful mention must be made of Sybille Sharma-Hublik who at an auspicious moment salvaged the typescript from a paper basket. And Gita Dolia (with Shilpin Patel in the wings) has been of greatest help in reading most critically every chapter in this book and adding their experiences to mine.

Gouri Pinto's drawing talent was, alas, discovered too late but she still managed to help us with some needed drawings; similarly, Nina Sengupta made several welcome contributions for all of which we are most grateful.

At the photographic department of the Sri Aurobindo Ashram Archives, Kiran Kakkad and Mita Deva were most helpful in solving some of our picture problems.

Most of the line drawings were taken from "The Mollusca of Krusadai Island" published by the Madras Government Museum. They have increased the usefulness of this book for which we are much obliged to the Director of Museum.

I am also much beholden to Norman Dowsett (Jr.) who in 1968 first introduced me to the shell life of Pondicherry and with whom I explored many an enjoyable and memorable beach farther south.

My lasting gratitude, however, belongs to **Fanny Mathieson,** whose gift of a splendid shell collection inspired and broughtforth this book.

FRED PINN

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Pondicherry Gastropods
in their scientific order

Pondicherry Gastropods
Check list

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INTRODUCTION

People all over the world have begun to be aware of the dreadful truth that the survival of Mankind depends to a large degree on the survival of his living environment—plants and animals. The terrible effects of deforestation, for instance, are not only a change in climate—for the worse—but also soil erosion, flooding as well as water shortage. The ruthless pollution of rivers and seas gradually killing all living organisms has already been noted in many places: the Mediterranean, for example, is said to be on the way to becoming a second "Dead Sea". The ecologists have many frightening stories to tell and the purpose of the new science of Ecology is to expose the damage already done and to find ways and means to protect and preserve what is still surviving.

In order that this protection and preservation can be done effectively a thorough knowledge of our environment is necessary. All aspects are important. Although sea shells—the live creatures—are only a small part of marine life, they are nevertheless an essential part of the sea. It is difficult to imagine what would happen if they suddenly disappeared. The mention of edible shellfish alone might conjure up some picture of a whole industry in ruins. In many regions of the world shells are also a considerable contributor to a poor family's income and diet.

The study of shell life is therefore as important a subject as that of any other group of sea animals, and the first step in the exploration of the "Kingdom of the shell" is the identification of each species; for the name of a shell and its family connection make it possible to deduce a great deal of information about its habitat and habits. It is only after placing a shell that deeper study can begin.

How to write this "guide" has caused some difficulty. Originally it was meant to be no more than a "check list" for a few interested shell collectors. With the growth of the collection it became clear that so many more shell families were represented on the Pondicherry coast than formerly suspected that it seemed worth while to enlarge the scope of recording—it became a "families affair".

The second problem was for whom to write ? At first this "guide" was to accompany the shell display in the Pondicherry Museum and provide some simple additional information. However, in the course of writing various requests arrived asking to cut down the lengthy descriptions of some text-books and instead concentrate on the habits and other fascinating aspects of the creatures. The biologists, on the other hand wanted as many biological details as possible because of the general lack of reference material. Thus a compromise had to be attempted and hopefully all readers will find something of use and interest.

Another question was whether to confine this publication only to the common gastropods (snails) or to include all species that were found in the course of a year's collecting. It was decided that only a complete record would be of real use to anyone wishing to explore the molluscs of this area.

The language has been kept simple but some technical terms had to be introduced to make the descriptions meaningful. The descriptions in their turn were reduced to a minimum dealing mostly only with the specific features of a particular shell.

Reference Material

It is a sad state of affairs that no book on the seashells of India is in print. Whatever was published in the past, together with the latest publication by the Madras Government Museum in 1952, is now out of print and practically inaccessible to any ordinary shell collector; even the experts have difficulty to get hold of them. In view of this utter lack of reference material I have used to the full whatever foreign publications I was able to get together in addition to the few rare Indian ones. Since all those books were written by world specialists whose wording I could not better and dare not tamper with, I have "lifted" in the name of scientific education and without a twinge of conscience several passages for which I apologise and gratefully acknowledge my indebtedness (see bibliography). Particular mention must be made of James Hornell and his book "Indian Molluscs". Hornell is considered the "Patron saint" of Indian Conchology. His phenomenal knowledge of Indian shell life would fill volumes if extracted from hidden publications; people familiar with his book will invisibly or even visibly bow reverentially at the mention of his name.

The locality

Of the collecting ground can be divided roughly into three sectors : (a) the stretch of beach in front of Pondicherry town from the Distilleries to the New Pier which rarely produced anything of interest; (b) the beach between the New Pier and the New Lighthouse which also proved barren and unproductive, and (c) the beach from the Distilleries northwards along the village of Kottakuppam and Kuilapalayam and Kottakarai. The last was at all times most rewarding where even a beginner could bring back after a short walk 15 to 20 different species with ease. The reasons for these differences are that boats usually do not beach in front of the town, and south of the New Pier catamarans bring out their catches already "sorted" on the return trip, thus having only fishes in their nets. But on the northern stretch the catches are brought from motorised fishing boats and actual sorting takes place after landing on the beach.

The sources of supply for the collection were either (1) the fishing nets directly, or (2) the shells found beach-combing which in fact, were the remains from the nets. A third source developed when the fishermen and their children

realized that my visits were regular and payments instant and satisfactory. As I appeared at the beginning of the fishing village the cry "sanghu" (shells) used to be raised and passed on by the "beach telegraph" and the children came running offering their treasures (as they thought). In this way quite a number of rarities came together which had been salvaged from the nets in anticipation of my purchasing power.

The time taken to make the collection covers a period of 16 months. I went beach-combing at least once a week when weather conditions promised a successful walk. After that no new species were brought back and it can therefore be assumed with some certainty that the present collection of some 200 species of sea snails (gastropods) is representative of the 10 Km. stretch (approx.) of the Pondicherry beach.

Identification has been problematical in view of the limited reference material (books and other collections) at our disposal. All the institutes and institutions we approached could not help. At last we made a final attempt at the Zoological Survey of India in Calcutta. Dr. N.V. Subba Rao, Director of the Department of Mollusca and his staff very kindly identified all the dubious specimens for us. We are most grateful for his assistance which has enabled us to present as complete a record of our findings as possible.

Occurrence and frequency rating

It must be clearly understood that the rating according to the number of shells collected over 18 months can only be taken as general guide and only applies to Pondicherry. There are shells described as "rare" which could be "uncommon" or even "common" a few miles north or south from here. The rating is no indication of their commercial value either. Moreover the description "common" or "very common" may be seasonal ; for instance , Hydatina velum appeared in large quantities for about three weeks and not another shells has been seen since.

The following scale should give an idea of the frequency of the shells' occurrence :

1— 5 = Very rare
6—10 = rare
11—20 = uncommon
21—40 = common
41 and over = very common.

ABOUT THE SHELLS

"What is this shell ? Is it an animal ?" This is a common question asked by many a newcomer to the beach and must be answered first. The shell is the covering of a soft-bodied animal which has usually died and vanished when the shell is picked up on the beach. It is a "dead shell". Should the animal still be inside the shell would be called a "live shell". "Dead" or "live" matters very much to the scientific collector. A "dead shell" may have been carried by currents from afar for hundreds of kilometres and washed up on the beach, and therefore does not live locally. A "live shell", on the other hand, is most likely at home where it was found; and that makes all the difference when it comes to "mapping" the home grounds of different species.

It is the animal inside the shell which has given the whole group its name: "*Molluscs*", meaning "soft-bodied" (from Latin "mollis" = soft). With its hundred thousand species—or thereabouts—it is the second largest group of the related creatures in the animal kingdom. These are divided into two main groups: *Land Molluscs* and *Sea Molluscs*. The use of the word "shell" is rather a loose one, sometimes referring to the animal and sometimes to the shell only. So if a shell is said to live on the reef, the meaning is of course that the animal with its shell inhabits the reef, for the shell by itself is dead and does not live anywhere.

The Classes

The *Seashells* (or *Sea Molluscs* or *Marine Molluscs*) are commonly divided into six classes, and further divided into families, each family having one genus or several genera with different kinds (species, plural also species).

Class: *Monoplacophora* is a new and very recently discovered class of the most primitive of all molluscs. Their bodies are segmented like worms and protected by delicate cap-like shells similar in shape to some limpet. They live at great depths, are extremely rare and are not likely to be met with in the ordinary way.

Class: *Chitons* (say: Ky-tens) or *Coat-of Mail* shells (also *Amphineura*) too, are a primitive group of molluscs. Their covering consists of eight separate Plates held together by a tough leathery girdle. The chitons live attached to rocks mostly in shallow water. There are about 600 known species.

Class: *Tusk Shells* (Scaphopoda = "boat-shaped feet") look like miniature elephant tusks. They live partly buried in the sand. There are about 200 different species.

Class: *Cephalopods* ("feet-on-their-heads") include squids, cuttlefish, octopus and nautilus. They are fast moving, active animals with very good eye-sight and powerful beaks; one of the longest of the 600 species measured some 23 m.!

Class: *Bivalves* (bi = two, valve = shell; "two shelled") are molluscs with two valves or shells joined together by a hinge. The shells are opened and shut by one or two powerful muscles. Most of the 10,000 species live in the sea. Another name for this class is *Pelecypods*, meaning "hatchet-footed", referring to the shape of the foot of many species in this class.

Class: *Univalves* (uni = one, valve = shell) are molluscs mostly with one coiled shell. They are the snails and slugs of garden, pond, river and sea. Some 80,000 species live on land, in fresh-water and in the sea. Another name for this class is *Gastropods*, meaning "stomach-footed," because stomach and foot are close together.

Names

Every known species in the animal kingdom has a name. The famous Swedish scientist Carl von Linne (Linnaeus) classified about two hundred years ago the plant and animal kingdom and gave a Latin name to each animal and plant known at that time; these names are internationally accepted and referred to by scientists. Usually, all species have three names: the first refers to its family, the second to the species and the third to the scientist who first described it. Thus *Strombus Marginatus Linne* means: this shell belongs to the family (genus) *Strombus* (wing shells), is the kind (species) *Marginatus* ("margined") and was first named and described by Linne. The scientific collector will normally only refer to the Latin name and not bother very much with the popular name. But the beginner usually prefers the name given in his own language which often is more meaningful than the Latin equivalent. It must be added, though, that some vernacular names seem rather fanciful; moreover, many shells, particularly the small and humble ones, do not have a name except the Latin one.

Parts of the Snail

The anatomy of a snail is a complex thing and of limited use to the beginner. But a few parts of the molluscs must be explained to make the descriptions and illustrations meaningful and help the observer of live specimens to understand what he is actually looking at.

The Foot is the part of the animal best known. Anyone who has ever watched a garden snail will remember the rippling "body" with the long tail end. This "body" and tail together is *The Foot* which also holds the stomach, hence, "the stomach-footed" (gastropod). This may serve the marine molluscs for as many as three different purposes:

(1) as a foot for moving about;
(2) as a spade for digging with its tip at great speed to a great depth;
(3) as a weapon by enveloping and suffocating smaller prey.

The Operculum (say O-per-kyoo-lum) is produced by the foot. It is of a horny substance and may be thought of as the "door" which closes the entrance to the shell after the animal has completely withdrawn; some species, however, have a very strong shelly operculum. The operculum .too may have more tasks than one:

(1) as a "door" it protects the entrance to the shell;
(2) as a lever it helps the wing shells to move by leaps and bounds;
(3) as a weapon the saw-shaped operculum of the wing shells helps to swipe away any enemy holding on to the shell.

The Mantle can often be seen completely covering a cowry shell; it is just above the foot and can be expanded to cover the entire shell or withdraw into the shell out of sight. The mantle actually produces the shell, the pattern and the beautiful gloss of the shell families like the cowries and the olives.

The Tentacles or "feelers" together with the eyes, often at the base of the tentacles, again are a well-known feature; but some of the sand-dwelling species are blind or have no eyes at all because they do not need them.

The Tongue called a *Radula* is a most unusual part of the snail's anatomy. Although it can only be studied under the microscope, its action can be seen on many a dead shell. It is a file-like tough ribbon with rows of thousands of teeth (80,000 in some land snails). The radula is a most effective feeding tool, rasping and breaking down vegetable matter to a size that can easily be swallowed by the snail. In the case of carnivorous ("flesh eating") species the radula is used for drilling holes into the shells of its prey. The snail then pushes its *Proboscis* or *Sucking Tube* through the hole, injects a digestive juice which serves as 'liquidizer' and then sucks out the liquidated and liquidized victim. All dead shells with small, beautifully round holes were subjected to this murderous treatment.

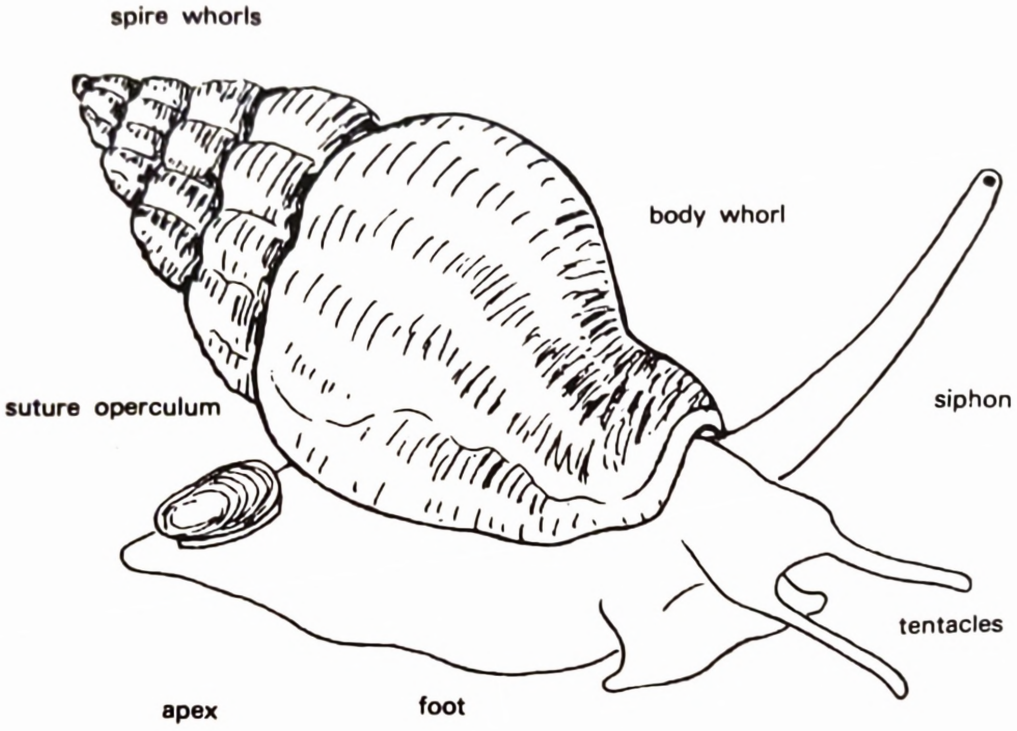
Looking at a shell

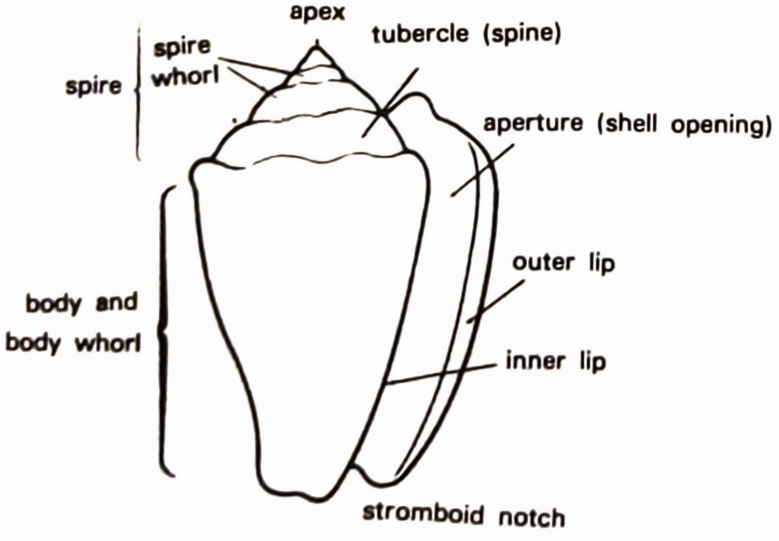
The whole shell of a snail is divided into two main parts: the top part is called the *Spire* with several *Spire Whorls* ending in the sometimes short *Apex*. The lower part is the *Body Whorl* ending sometimes in a very long *Siphonal Canal*. The apex is the *Back* end of the shell and the siphonal canal the *Front*. It is through the siphonal canal that the snail puts out its *Proboscis* or *Sucking Tube* or even the whole *Head* when feeding or hunting.

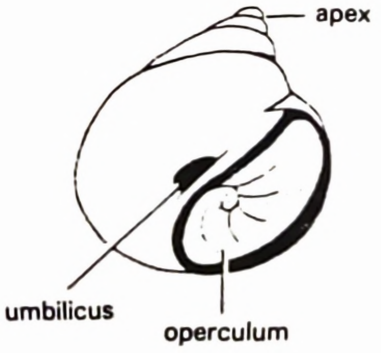
The shell opening is also called its *Mouth* with an *Outer Lip* and *an Inner Lip*. Another name for "inner lip" is *"Columella"*.

On the *Columella* may be found a *Callus;* this is a thickened layer of glassy, shelly material. Often near the callus is an opening, deep or shallow, formed by the last coil or coils of the shell; this is called the *Umbilicus*.

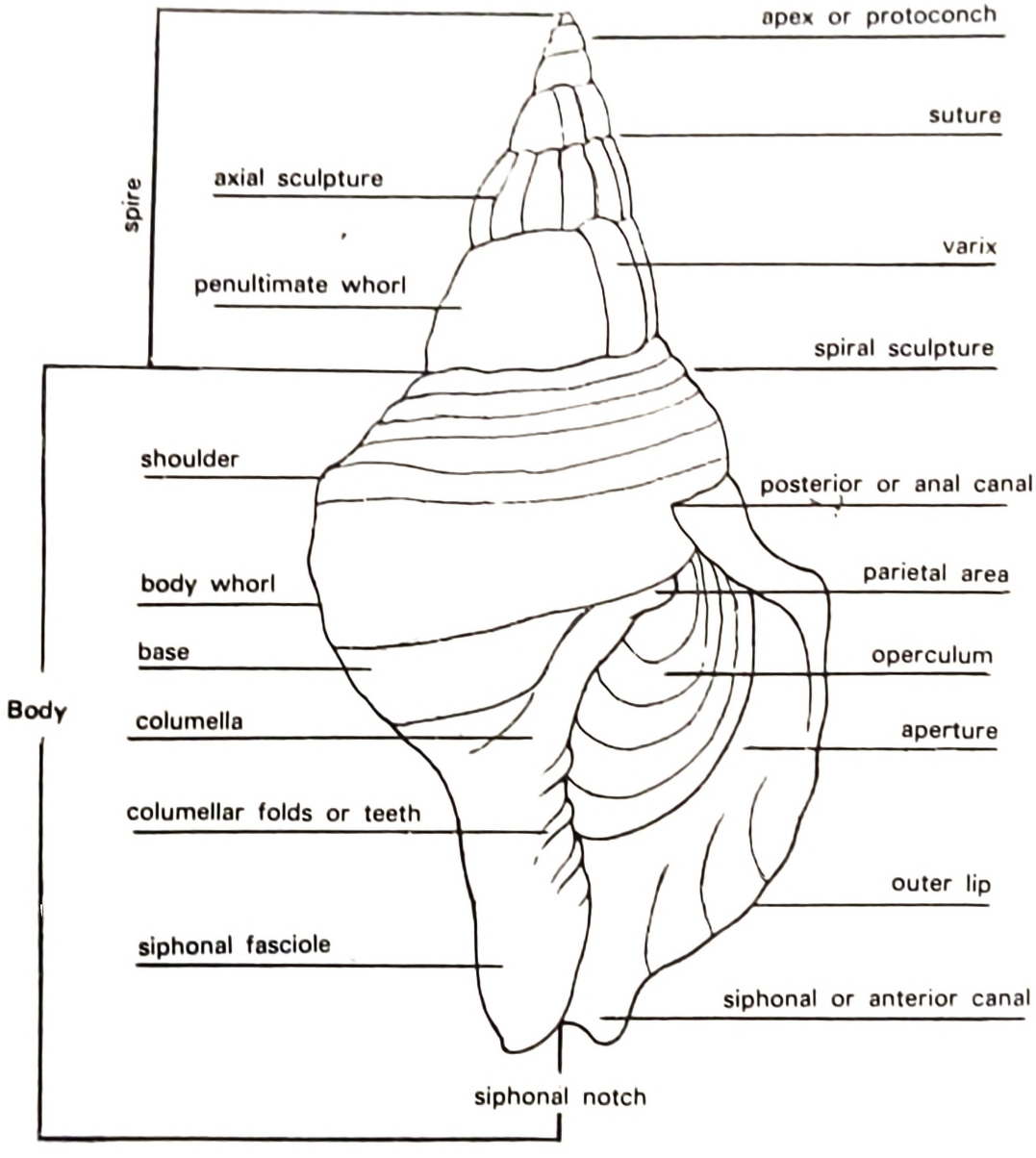
There is a particular way of looking at a shell when comparing it with its description: The *Opening (Aperture)* must be on the right hand side, the *Spire* with its *Apex* at the top and the *Siphonal Canal* at the bottom. If the opening happens to be on the left it is a very rare shell indeed.







Note : The spire is the hind part of the shell.


apex or protoconch
suture
axial sculpture
varix
penultimate whorl
spiral sculpture
spire
shoulder
posterior or anal canal
body whorl
parietal area
base
operculum
Body
columella
aperture
columellar folds or teeth
outer lip
siphonal fasciole
siphonal or anterior canal
siphonal notch

LIMPETS (PATELLIDAE)

There are about 400 species of *Limpets* living on the rocky shores of temperate and tropical seas. They include two main families, the *Acmaeidae* and the *Patellidae*. The Acmaeidae have gills whereas the patellidae have folds on the mantle-edge which act as secondary gills. The other difference is that the inside of the Acmaeidae shells is like porcelain whilst the patellidae are iridescent.

"In the limpets the shell is conical and forms a stony cap under which the animal lives secure. The limpets have a broad sole-like foot; this gives them power to cling tenaciously to the rocks on which they have their home. The broad muscular foot-disc functions after the manner of a sucker by the total exclusion of air from beneath it; atmospheric pressure comes into play and has to be overcome before the limpet can be pulled away from its foothold. An atmospheric pressure at sea level amounts to 15 lbs. to the square inch, and as the conical shape of the shell affords no grip to the fingers, it is well nigh hopeless to try to detach a limpet from its rock unless we can take it unawares; then when the edges of the shell are raised slightly, a knife slipped deftly underneath will dislodge the animal by a sudden wrench before contraction of the foot muscles enables it to create a vacuum beneath.

Limpets live between tide marks on rocky coasts. They are not very abundant in India and are usually small. When suitable rocks occur, they are often to be found so near to high tide level that the sea leaves them high and dry for several hours twice a day. They feed upon the smaller seaweeds covering rock surfaces in a thin velvety mantle. On coasts where limpets abound, I have often heard a continuous rasping hum rising from the rocks around. It was a meal-time with the limpets; a multitude were browsing on the tiny weeds growing on the rocks, the noise arising from the file-like action of myriads of minute teeth. The radula or dental ribbon ("tongue") of the limpet is longer than the animal's whole body; in the Common British Limpet nearly 2,000 teeth have been counted on the radula, set in about 160 rows of 12 teeth each. The hinder part lies coiled up like a watch spring. New teeth are continually formed at the inner end and the ribbon unrolls a little as required to make good the waste going on at the front end from the wearing down of the teeth in use.

Limpets have a well marked homing instinct, and though they may crawl several feet away from their home, they return there regularly from their foraging expeditions. In soft rocks they rasp out quite a deep pit at the place they choose for a home; on hard rocks this spot is recognisable by its smoothness and may even be a little lower than the surrounding surface . The muscular foot does not only serve as a safety suction pad but also pulls down the shell to touch the rock

surface as closely as possible; the reason for this tight fit is to avoid evaporation during the long spells of low tide. The sharp edge of the limpet's shell soon enough carves out a perfectly air and water-tight base—hence the "homing instinct".

"In Europe the poorer classes in several countries—France, Italy, Ireland—value the limpet as a cheap delicacy; very large quantities are collected and eaten; in India their food importance is almost negligible; so far as I know it is only at Covelong, on the Madras coast, where they are more numerous than I have seen anywhere else in India, that some of the poorer people are accustomed to collect them to eke out their meagre diet. They are known there as "Unai" in Tamil". (Hornell)

The purpose of a particular shape of a shell is not always obvious, but in the limpets it is quite clear that the flat cone effectively resists the pounding of the waves as the tide goes out or comes in.

Cellana Radiata (Born) (Fig.1)

25mm. This is a low, conical shell with radiating brown markings better seen from the inside. All our specimens are "dead" with the apex badly damaged. Uncommon.

TOP SHELLS (TROCHIDAE)

It was that universal toy—the Top—that gave the conical, flat-bottomed shells their name. Over a thousand species of *Tops* are found in all temperate and tropical waters where they inhabit the shallow, intertidal zone. All of them are vegetarians.

Hornell takes the *Top Shells* and the *Turban Shells* together for, he says, "they are much alike in appearance, both comprising some of the commonest of our littoral shells; in shape they are conical and are beautifully pearly within. The larger kinds are commercially valuable. The widely spread "Trochas" shell of trade (Trochus niloticus, at home in the Andamans) and the even more valuable "Green snail" (Turbo marmoratus) are in great demand for pearl button manufacture" (c. 1948).

"The two families are easily distinguished by the nature of the operculum, a flattened, hard structure found upon the upper surface of the tail end of the foot in many gastropods (snails). When the animal, alarmed or attacked, retires into its shell, the operculum serves as a door to close the mouth of the shell and to keep the intruder out. In the Top shells it is horny and marked with a closely-set spiral; in the Turban shells it is stout, massive and planoconvex in shape; some are so large as to be heavy enough for use as paper weights, quite 5 cm. (and more) in diameter" (Hornell).

Trochus Radiatus (Gmelin) (Fig.2)

18 mm. The shell is almost conical with a beaded surface throughout. It is easily recognised by its broad red and maroon vertical stripes alternating with green. The whitish base is strongly ridged and speckled with fine red dots. Very rare.

Trochus Radiatus

Umbonium Vestiarium (Linne) (Fig.3)

6 mm. The spine of the shell is depressed and the body whorl flattened; it is aptly called the *"Button Shell"* or *"Button Top"* There are many colour variations from plain white to dark grey, many tinges of pinks, browns and grey, blotched, striped and banded.

This species occurs at the mouth of sandy backwaters where it lives in large numbers a few centimetres below the muddy surface. Great quantities of the button shells are collected along the Bombay coast and the snail is eaten as a delicacy. Common.

Umbonium Vestiarium

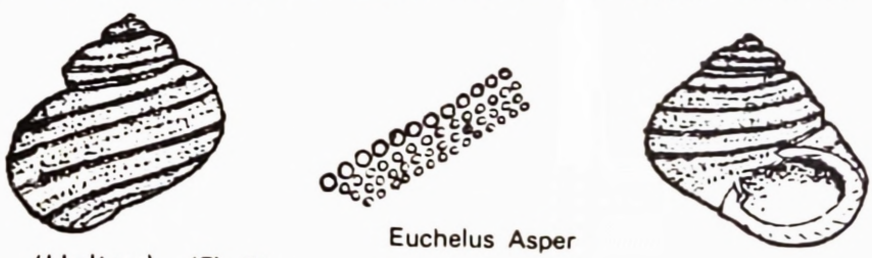
Calliostoma Tranquebarica (Roeding) (Fig.4)

16 mm. The yellowish-brownish shell is perfectly conical. The whorls are separated by a white double ridge marked with regular brown blotches and dots between them. The whole shell is faintly ridged with rows of brown dots and similar marking on the base.

"Calliostoma top shells are the queens of the family. All are light weight shells with delicate beading and bright colours. Most are cold water inhabitants formed among deep water beds of algae. The eggs are laid in gelatinous ribbons" (Abbott).Uncommon.

Euchelus Asper (Gmelin) Var. tricarinatus (Fig.5)

34 mm. Shaped like a Turban shell and enveloped in lime or algae, this species is not easily identified. There are, however, distinctive features: the shell is covered in beady ridges with three or four more prominent ones (the mark of the variation tricarinatus). In a cleaned condition the shell appears in a light brown colour and the prominent ridges have brown dots and white dashes. Another characteristic to look for is a well-marked tooth near the lower end of the columella. Uncommon.



Euchelus Asper

Euchelus Quadricarinatus (Holten) (Fig.6)

16 mm. The shell is completely covered in spiral beaded ridges; as the name implies four of these ridges are raised above the others; diagonal markings produce a pleasing pattern on the ridges with 2 or 3 beads, black and white alternately. Uncommon.

Euchelus Atratus (Gmelin) (Fig.7)

17 mm. This species is rather variable in shape and colouration; it has strongly developed beaded spiral ridges of a reddish-brown colour. The body whorl is marked by irregular oblique rows of purplish brown spots and white streaks Uncommon.

TURBAN SHELLS (TURBINIDAE)

There are about 500 species of *Turban Shells*. Their main distinction from the Top shells is a hard, limy operculum; this is flat on the side attached to the animal's foot and rounded outside. The largest member of this family is the Green Turban (Turbo marmoratus). Its white operculum may weigh up to one pound. It is also the shell which for centuries has been a major source of high-grade mother-of-pearl.

"The opercula of one species, Turbo petholatus (found in South India), vividly mottled with flushes of green and brown, are worked in Fiji into fancy jewellery. In former days the Maoris of New Zealand used their opercula as eyes for their idols. Even in India these opercula have value. They find a place with all sorts of local shells and marine curiosities in booths within the main entrance to Rameswaram Temple for sale to the pilgrims and devotees who flock there in thousands from all parts of India. The perfect ones are retailed at 8 annas a thousand, sea-worn ones at considerably less (c. 1948). The Tamil name is "ambiliman" ("the disc of the moon"). The flesh of the Turbo is eaten by the island people (Valayans) but that of Trochus is not esteemed owing to the small size of the local species". (Hornell).

Turbo Intercostalis (Menke) (Fig.8)

40 mm. The surface of the shell has raised spiral ridges separated by three lower ones. The colouration is highly variable, it is light green with broad, dark-brown vertical streaks. Very rare.

Turbo Intercostalis

NERITES (Neritidae)

Several hundred species of *Nerites* are known worldwide. They live in very varying habitats such as shallow water, rocky shores, springs, rivers, swamps and even trees. Many species are "amphibious", which means, they can live out of water for a long time and are therefore found at the high tide level. All are vegetarians.

The Nerites are liable to be confused with other families on account of some identical peculiarities: the aperture has the shape of a half-moon similar to the moonshells; the distinguishing feature, however, is the columella having two or more teeth, though sometimes barely visible.

"Considering their size, the shells of Nerites are extremely massive. They live at the edge of the sea and are often tumbled off their lodgement on the rocks by waves; if they were less strongly built their shells would be broken and destroyed.

The shells show externally distinct spiral markings on one side of the apex; internally in adults the cavity is simple and rounded. Study of the life history of Nerita shows that it begins life with a shell furnished with a well-marked spire wound round a central column, the columella. As growth proceeds the columella and whorl partitions are gradually absorbed. It would seem that the animal has to be so busy with strengthening the external wall of its dwelling that it can spare no limy material for interior decoration. The shell is often prettily marked and in old ones the surface is much corroded and pitted; here it is appropriate to mention that mollusc shells are normally protected by a horny skin, the *Periostracum;* if the periostracum be worn away, the exposed limy shell beneath is liable to chemical corrosion, especially in shells often exposed by the receding tide.

As in the Turbos, the operculum in the whole family of the Nerites is strong. Usually it is semi-lunar in shape. At one end is a finger-like projection that hitches behind the columellar lip and forms a locking device, giving additional security.

A peculiar little hermit crab (Cenobita rugosa) that frequents the upper beach and lives almost entirely out of water, finds the empty shell of Nerita just ideal to its wants; indeed, it has adapted the shape of its big claw so precisely to the form of the mouth of the shell that when it withdraws inside, the big claw closes the aperture as perfectly as did the operculum of the original owner". (Hornell).

1. **Nerita Albicilla** (Linne) (Fig.9)

22 mm. Our rather worn specimen shows faint spiral grooves and none of the supposed "fine teeth on inner and outer lip"; the callus on the columella side is granulated; the shell surface has black and white markings leaving a more or less regular white band in the middle. Very rare.

2. **Nerita Polita** (Linne) (Fig.10)

23 mm. A finely grooved shell with smooth and glossy surface. There are three spiral bands with squarish blotches and four light grey bands similarly patterned. Very rare.

3. **Nerita Chamaeleon** (Linne) (Fig.11)

24 mm. The surface has spiral ridges extending to the callus; teeth on both lips; the shell is black with irregular white dashes on the ridges and vertical zigzag lines. Very rare.

4. **Nerita** (Ritena) **Maura** (Recluz) (Fig.12)

22 mm. The shell has flat spiral ridges and teeth on both lips. It is black with rows of white spots or blotches. Very rare.

5. **Nerita** Sp. (Fig.13)

20 mm. The shell is almost oval; it has widely spaced black spiral ridges with irregular dots. The notable feature, however, is the unusually broad yellowish callus with four tiny teeth on the inner lip. Very rare.

Nerita Albicilla

Nerita Polita

Nerita Chamaeleon

Nerita Maura

SCREW SHELLS (TURRITELLIDAE)

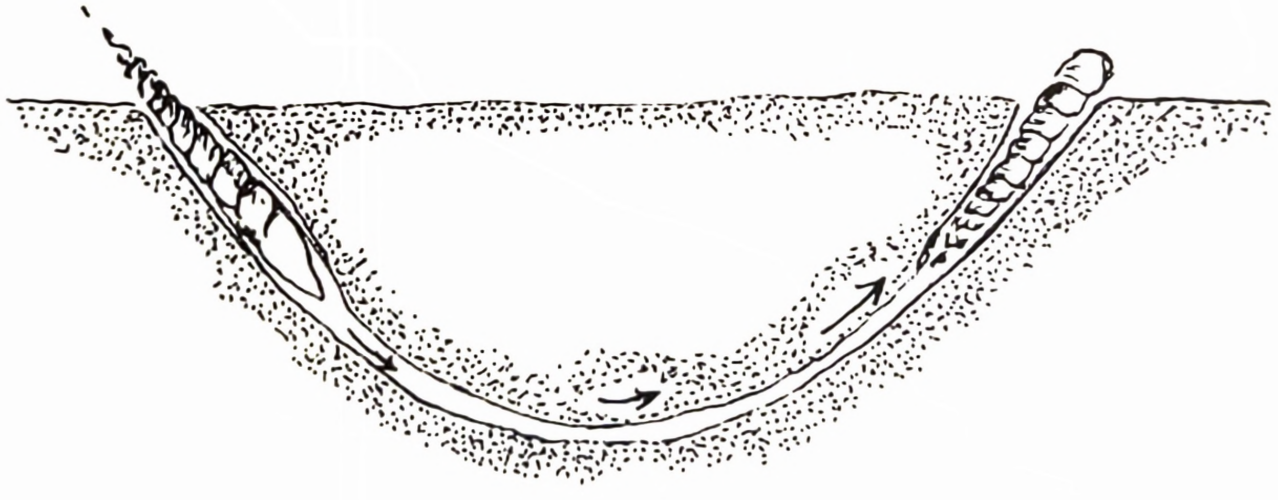
There are over 50 species in this family which live in muddy sands of tropical waters. It is difficult to believe but they are relatives of the Periwinkles. They are easily mistaken for Augers; however, a glance at the aperture will reveal their family identity; The Augers have a very short siphonal canal or even only a notch; The absence of it makes it a "Screw". The shells can reach a length of 15 cm.

The "screws" are detritus feeders preferring vegetable matter. The operculum is circular, very thin and chitinous with many whorls.

Some species of Turritellas lay stalked egg capsules while others brood their young within the oviduct. Fossil specimens many millions of years old have been found with numerous young shells inside the mother's shell.

In some areas Turritellas are so plentiful that they are gathered into great piles and burnt to produce lime (Chunam) for building work.

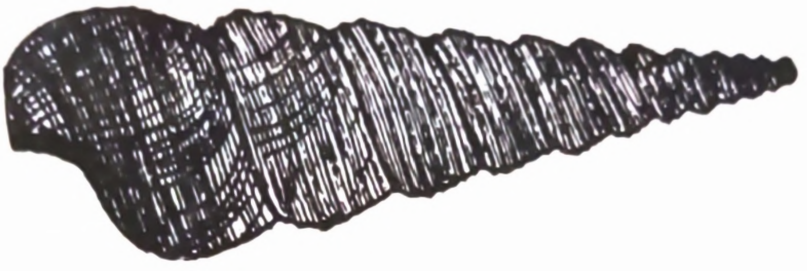
Some years ago I recorded a visit to "the ever-changing backwater two miles South of Pondicherry, at Vemba Kirappalayam, with its mud-dwellers, especially Turritella duplicata and Turritella attenuata. At low tide hundreds of these species can be seen sticking out of the mud with their apex buried and their aperture 3 to 5 cms. above the ground. One fascinating aspect of this sight is the fact that about half the shells stand upright at an angle of 90 degrees and the other half slanting at approximately 45 degrees. This astonishing result of a count may, of course, have been a mere coincident, but is perhaps worthy of further investigation. The even more fascinating and puzzling question is: how do the shells get themselves as it were, backwards. into the mud ? One explanation suggests that the snails do not move backwards at all, but dig first down and then upwards:



There still remains another riddle: How do they get so high above the mud surface ?"

Turritella Duplicata (Lamarck) (Fig. 14)

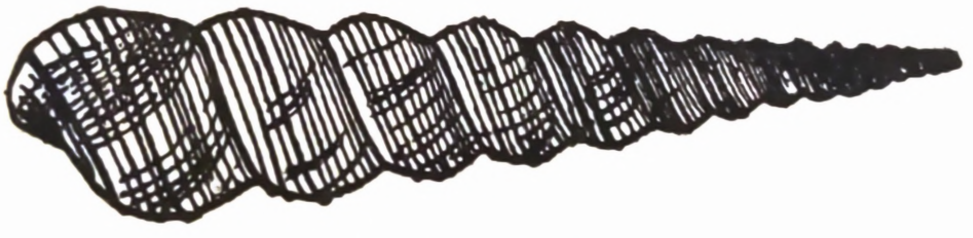
16 mm. The distinguishing mark between this and the next species are two sharp ridges in the middle of each whorl. In fact, in young specimens they may be so distinct as to give the whorls an angular appearance. This sharp angle tends to disappear in larger specimens but is retained in the top five or six whorls. Common



Turritella Duplicata

Turritella Attenuata (Reeve) (Fig. 15)

110 mm. The whorls are rounded and smooth from apex to aperture. Common.



Turritella Attenuata

Turritella Columnaris (Fig. 16)

80 mm. The whorls are slightly ridged and flattish. The yellowish brown shell has vertical brown stripes and blotches. Uncommon.

SUNDIALS (ARCHITECTONICIDAE)

The *Sundial Shells* get their name from the ancient sunclock though there is not really much resemblance. They are also called *Staircase Shells;* this is a much better name as the underside of the shell indeed looks like a winding staircase.

The shells of the sundials do not look at all like Ceriths and Screw shells; but they are closely related to them by their body structure.

Although many different kinds of sundials can be found as fossils, there are now only about 40 living species; nearly all of them are found in the Indo-Pacific oceans

The sundial shells live mainly in tropical and shallow waters and usually occur in sandy areas. They may be feeding on a marine animal called the Sea-pansy as these two are often found close together. Some kinds live near colonies of soft corals and are in some way connected with them.

A strange thing about the sundials is that they begin life in a shell opening on the left (sinistral) yet as they grow bigger they change direction and the "wrong" beginning is hidden under the succeeding whorls.

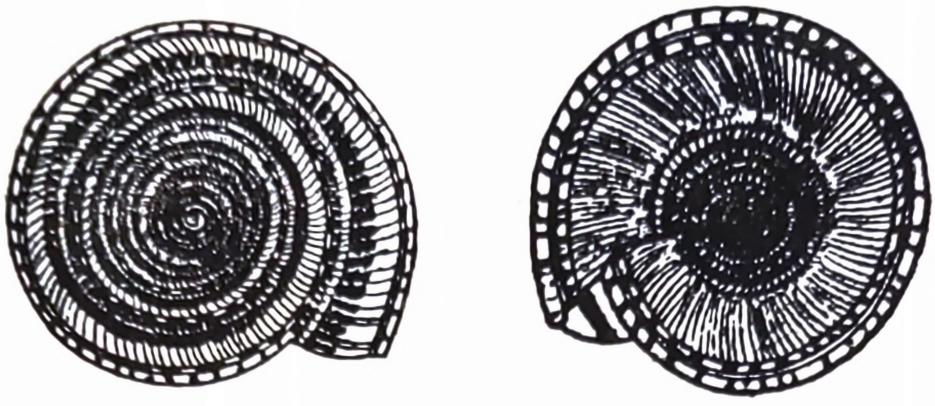
The Sundial or staircase shells of Pondicherry are a most interesting family. Ten species have been collected in the course of several years; one is common, three are uncommon and seasonally rare, and six are extremely rare. Only five species have been identified, but the others will hopefully also be named in due course.

Although no two shells even of the same species are alike, it has been possible to establish that each species has a distinct pattern by putting many specimens together and comparing them with similar lots of other species. In this way identification has become a matter of flecks, blotches, dots, and dashes. In a few cases sculpturing of the shell (seen under a magnifying glass) has shown to be a distinct feature of identification.

Considering that there are only about 40 species of Sundials in the world, ten seems a splendid record for one locality.

1. **Architectonica Perspectiva** (Linne) (Fig. 17)

47 mm. This is the one Sundial shell that cannot be mistaken because of its continuous black line. It is the most common of the Sundials found at Pondicherry and appears in fair numbers. The base is white with regular brown dashes.



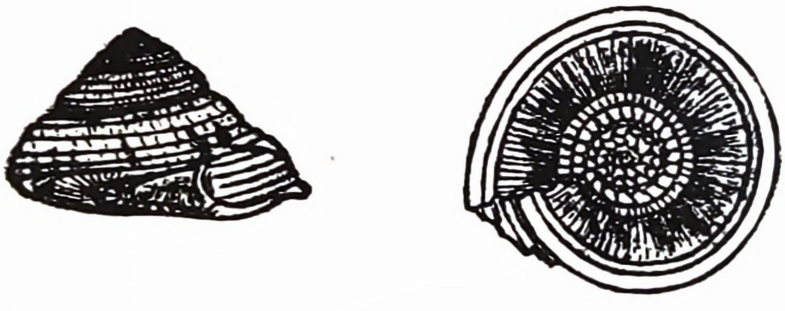
Architectonica Perspectiva (upper and under side)

2. **Architectonica Purpurata** (Hinds) (Fig.18)

35 mm. It is closely blotched and speckled and the rest is a medium purple. The base is heavily marked with lines and blotches. Rare.

3. **Architectonica Laevigata** (Lamarck) (Fig.19)

35 mm. An uncommon Sundial and easily confused with A. Purpurata. The distinguishing marks are that it is less closely blotched and speckled and only the upper half of the shell shows a purplish tinge. The base is marked with lines and blotches. The differences between the two species come out clearly when the two are put side by side.



Architectonica Laevigata (upper and under side)

4. **Architectonica Perdix** (Hinds) (Fig.20)

35 mm. The points to note are the broad band of a pinky flesh colour without any markings and the chestnut dashed blotches. On the base the outer ridges are flecked with brown dash-dot. Rare.

5. **Architectonica** Sp. (Fig.21)

37 mm. Note the far apart regular blotches. The base is flesh coloured and marked on outer and inner ridges. Very rare.

6. **Architectonica** Sp. (Fig.22)

32 mm. Irregular blotches. A distinct pure white line beginning at the apex marks the upper half of the shell. The base is light brown with irregular brown flecks on outer and inner ridges. Very rare.

7. **Architectonica** Sp. (Fig.23)

27 mm. Note the deep grooves throughout and especially on the last (lowest) whorl. The narrow bands are very beaded. There is a distinct white line with delicate brown dashes—a very beautifully sculptured and marked shell. The base is off-white, also deeply grooved with fairly regular brown dots, particularly along the inner ridges. Very rare.

8. **Architectonica** Sp. (Fig.24)

28 mm. Though somewhat differently marked, it could be just a variation of the preceding shell (No. 7). Very rare.

9. **Architectonica** Sp. (Fig.25)

24 mm. The lower whorl is very smooth. The narrow bands are very delicately dotted and dashed, a distinct white line is present like in the two preceding species. Very rare.

10. **Heliacus Stramineus** (Gmelin) (Fig.26)

19 mm. The shell has fine spiral grooves and bead-like sculpturing on the ridges. A look at the underside makes it clear why this seemingly different shell belongs to the family of staircase shells. It is a very light brown throughout without any other markings. Very rare.

HORN SHELLS (CERITHIACEA)

"The *Horn Shells* are a group of adventurous and gregarious univalves plentiful along the seashores and in brackish and fresh water. The sea species are common on mud banks and pools in the intertidal area and among the seaweeds on which they feed. The brackish-water ones abound in the oozy slime flats of estuaries; and those of the fresh-water are found on the sandy and muddy banks of rivers and lakes.

Horn shells have a tendency to migrate from the sea and adjust themselves to the new environment. They are often seen moving on semi-fluid slime, slowly creeping over low-lying land and browsing on the tiny vegetable growths on the bases of the trunks of coconut trees and roots of mangroves. They return to the slimy beds after feeding. These univalves are capable of remaining out of water for several days because their breathing system is specialized: they have a well developed siphony and their gill filaments are broken up into a close network of blood tubes. Zoologists say that some species can live out of water for three months.

"These univalves possess shells which vary in size and sculpture, but all are elongated, tapering towards the apex and broad and bell-like at the mouth end. They resemble small "horns" or "trumpets" and hence the name *Horn Shells*....

Potamides is a brackish water genus often found in multitudes on the mud flats of estuaries. Especially in the months of February and March the weed-grown shallows with slimy bottom will be found to be teeming with *Potamides*....

Economically Horn Shells are very important and useful. In many parts of India—Konkan districts of the West Godavari and Krishna in the east and Tinnelveli and Tuticorin in the south—the small shells of Cerithium and Potamides are collected in basketfuls, burnt in Kilns and converted into quick-lime. This lime slaked with water is ideal for white-washing. The flesh of the large Telescopium is wholesome food". (Encyclopaedia of Indian Natural History).

Cerithiacea Cingulata (Gmelin) (Fig.27)

26 mm. Though small, this is a pretty shell when looked at through the magnifying glass (after cleaning): The body whorl is smooth with grey and brown bands ending at the top in a ridge of white beads, all following whorls repeat a pattern of two grey and one white beady ridges. Opposite the flaring white lip is a varice-like bulge, similar "varices" are on successive whorls.

This species is often found in large numbers on mud, playing the part of the humble scavengers. At the backwaters south of Pondicherry, for instance, they simply litter the edge of the water at low tide and can be scooped up by the handful. At Tuticorin Lime-kiln women collect them to be burnt in specially small kilns into the best quality of lime for white-washing.

Telescopium Telescopium (Linne) (Fig 28)

88 mm. One of the largest and heaviest of the Horn shells are Telescope shells which grow to a length of 15 cm. They prefer the upper areas of mud flats where the water reaches only at high tide and where the shade is heavy from the mangrove trees. They are foragers in algae-rich mud and generally feed only at night or during rainy periods.

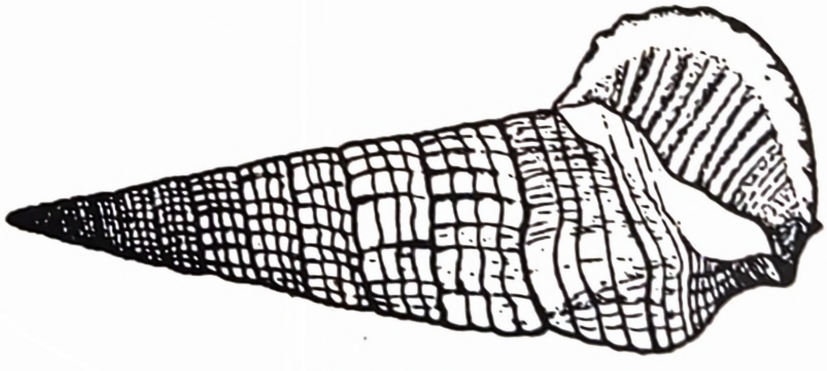
Some shell species seem to be particularly "accident prone" and Telescopium is one of them. The most astonishing freaks have been found with half the spire bent at right angles or the top of the spire only partly connected to the bottom whorls.

In the Philippines the flesh of the Horn shell is esteemed a healthy food; the shells are thrown upon fires and when sufficiently cooked the apex of the spire is broken off and the animal sucked out through the broken end.

The normally perfectly conical brown shell may at times be mistaken for a cone because of the missing thick outer lip; this lack, however, occurs only in immatures and still growing shells. Uncommon.

Terebra Palustris (Linne) (Fig.29)

130 mm. A large conical brown shell with four flat ridges to each whorl and deep spiral grooves. The outer lip is flared and near the columella is a humped varix on the body whorl. Very rare.



Terebra Palustris

PARASITIC SNAILS (EULIMIDAE)

Balcis Martinii (A. Adams) (Fig.30)

37 mm. In the "Compendium of Seashells" this shell belongs to the family *Eulimidae* and the superfamily *Eulimacea.* In the scientific order this follows the superfamily *Cerithiacea.* However, P. Dance in his "Seashells" (P. 83) puts it into his chapter on opisthobranchs with "Bubble shells and their relatives". He writes: "Balcis Martinii is a large representative of a widespread group of Molluscs which are mostly parasitic on other organisms and whose shells are usually tiny, slender, glossy and white". They feed especially on echinoderms. An amusing feature of this shell is its slightly twisted and bent apex. Rare.

WENTLETRAPS (EPITONIIDAE)

"Wentletrap" is a Dutch word for "winding staircase" which describes the shape of these shells very well; some species are indeed only a loosely coiled tube getting narrower towards the apex justifying also the name *"Staircase Shells"*.

The varices on the coils indicate a pause in the growth of the animal, strengthening the temporary outer lip of the shell. (The harp shells have a similar habit).

The Wentletraps are found in all seas, but the warm and temperate waters have a much greater number of the total of 200 species than cold ones.

The Wentletraps live in shallow water among soft coral, sea anemones and mushroom corals (fungia) on which they seem to feed. It is most probably the poison in these creatures which enable the Wentletraps to make a purple dye for use as a defensive weapon (like the Violet snails and the sea hares) -

The eggs are laid in sand—covered strands.

Epitonium Scalare (Linne) (Fig.31)

50 mm. Ever since this shell was discovered it has been a favourite with all shell collectors. Its English name "Precious Wentletrap" hints at the great value it possessed. The story goes that an English duchess, determined to have a specimen for her collection, exchanged for it a large farm. During the 19th century the Precious Wentletrap fetched high prices at shell auctions. So great was the demand and so high the price paid that Chinese craftsmen made beautiful specimens from rice paste, baked hard, deceiving even the expert.

Although a number of specimens have been caught by the fishermen of Pondicherry, it still counts as a rare shell.

Epitonium Lamellosum (Lamarck) (Fig.32)

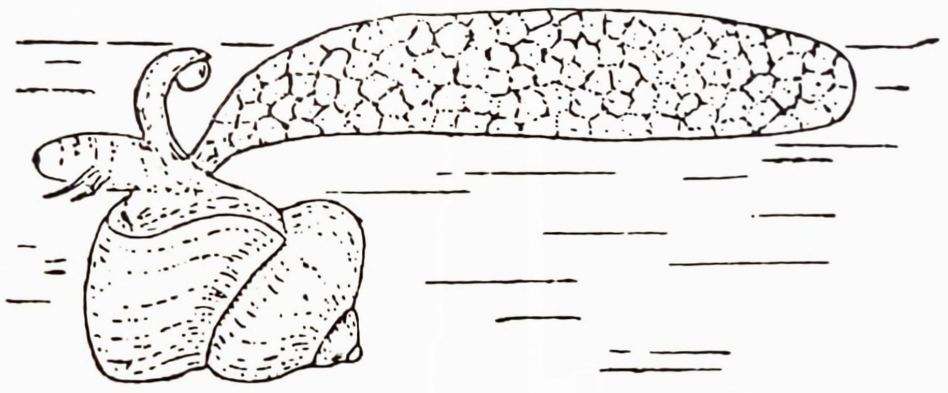
17 mm. In appearance the shell resembles E.Scalare except that the lamellae (ribs) are proportionately more delicate. Our single specimen is white and "dead". The proper colouring should have been a pale fawn and the lamellae, apex and aperture white. Very rare.

Epitonium Lamellosum

THE VIOLET SNAILS (JANTHINIDAE)

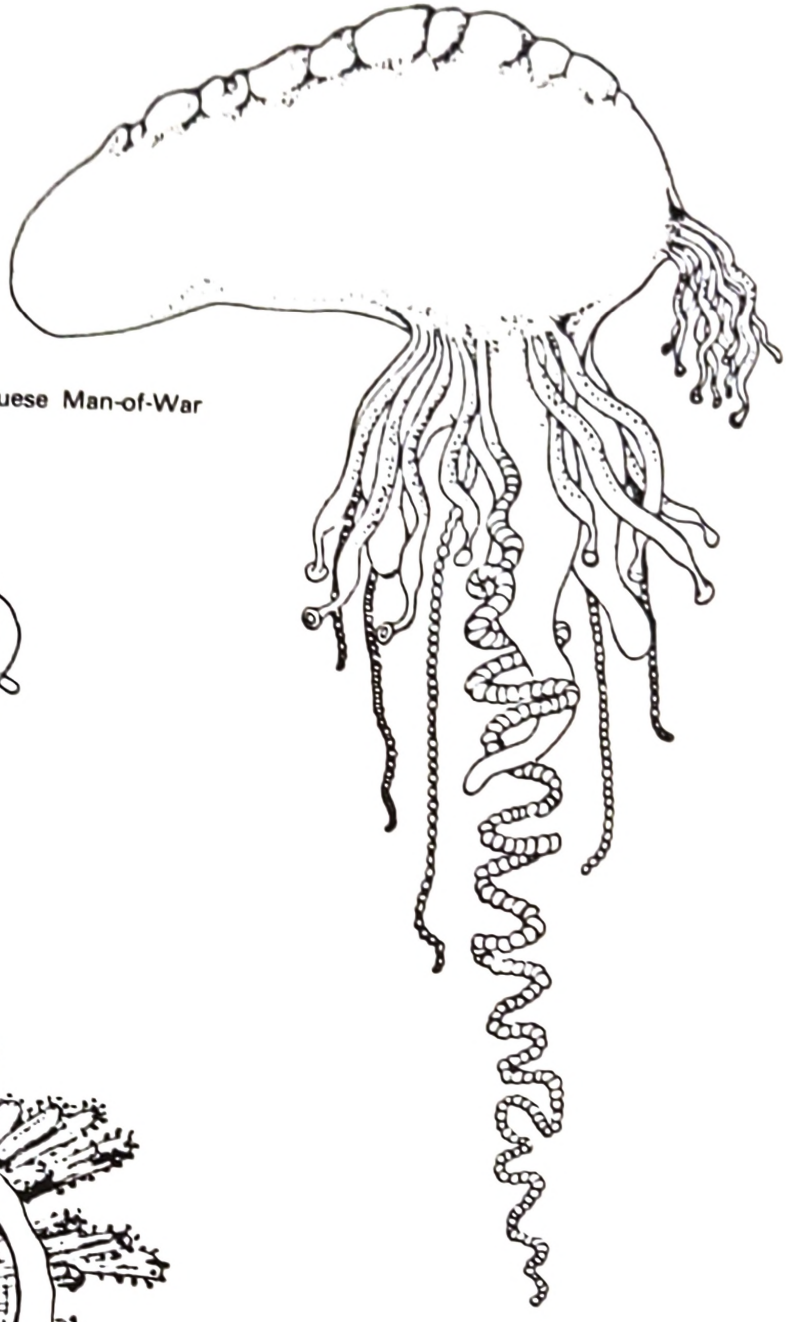
The Violet Snails are a rather unique and fascinating family of only five species. They drift on the surface of all warm seas of the world driven by the wind and carried by the currents, and they do so in an upside-down position. Since they cannot deliberately go in search for their food but drift by chance into it, they need no eyes: they are blind or eyes are even absent.

"Sometimes they are cast ashore alive and if we put one into a bowl of sea water we see how clearly they have overcome the difficulty of keeping afloat. Under natural conditions they float with the spire of the shell downwards; to the hinder end of the small upturned foot is attached a long, tongue-shaped frothy float composed of a multitude of air bubbles entangled in a transparent secretion of the foot. Each bubble is formed separately by the foot and added to the near end of the float; the secretion forming the envelope of the bubble coagulates on contact with the water and hardens into a delicate tough membrane" (Hornell)

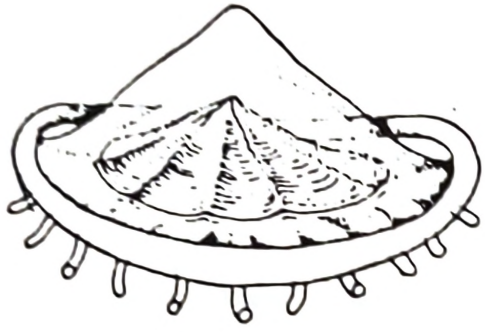


Living appearance of *Ianthina* with its frothy float attached to the foot. A freshly formed 'bubble' is held in the curved tip of the foot, ready to be added to the float. × 1.

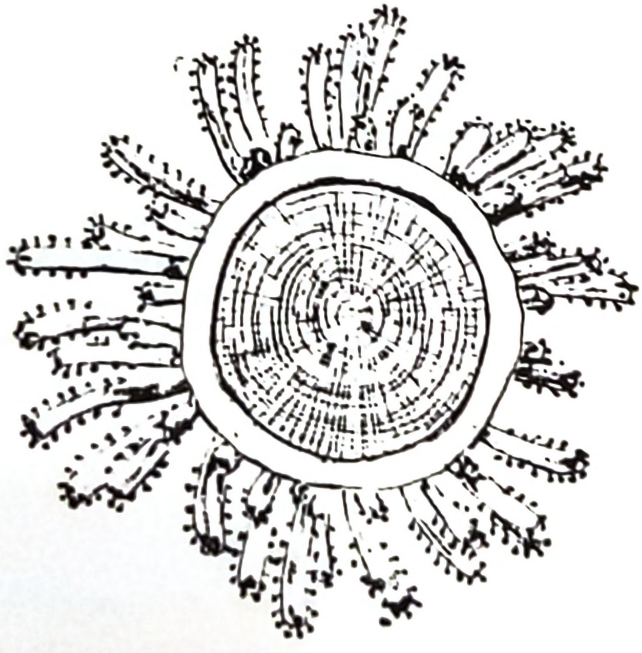
The Violet snails are gregarious and float about in shoals of at times enormous size feeding on oceanic jelly-fishes; it is not clear whether the Janthinas drift into their prey or *vice versa,* but somehow they seem to meet. When these snails are washed up on the beach they always are accompanied by one, two or three species of their favourite diet, namely the Portuguese man-of-war (physalia), the sailor-by-the-wind and Porpita. Incidentally, all these are blue and may account for the colour of the snail's shell and its sac of purple ink. But the menu also includes planktonic animals, crustacea and even small barnacles which can be found settled on the shell and probably are allowed to stay there as an "emergency ration". As the snail cannot see, it must be smelling its prey which it attacks ferociously and chews up greedily. The ink is probably used to anaesthetize the prey apart from serving as defensive weapon or when irritated. The puzzle in this feeding is how Janthina can digest the Portuguese man-of-war which has many long tentacles with numerous poison cells most painful when touching the human skin.



Portuguese Man-of-War

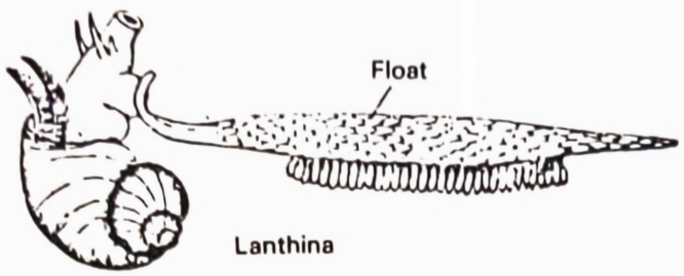


Sailor by the wind (x2)



Porpita (x3)

During the breeding season some species fasten their egg capsules to the underside of the bubble float and even extend this "raft" to great length to accommodate all the pink capsules.



A somewhat fanciful illustration of Janthina with float and attached egg capsules.

When observing alive Janthina in an aquarium one will notice how from time to time the animal rises above the surface for "a breath of fresh air" on which it depends. Once a shell has lost its float it will sink to the bottom and die.

The appearance of the violet snails on the Pondicherry coast varies from year to year according to weather conditions. 1987 produced just two small specimens of Janthina globosa with a few portuguese men-of-war. In previous years, however, large numbers have been picked up.

1. **Janthina Janthina** (Linne) (Fig.33)

17 mm. The upper part of this shell is very pale blue, almost white whilst the lower half of the body whorl, turning into a base, becomes a deep blue or violet. As the shell floats upside-down the pale colour matches the surrounding water (seen from under the water) and the dark blue blends with the sea (seen from outside the water). This colour division and the flattened shape of the shell distinguish it from Janthina globosa. The other difference is that it does not attach its eggs to the bubble float since it is ovoviviparous; it gives birth to larvae that have developed in the eggs and which are incubated inside the mother. To make sure of the continuation of the genus under these constant travelling conditions (and blindness) the violet snails are hermaphrodites, meaning they possess the sex organs of both sexes.

2. **Janthina Globosa** (Swainson) (Fig.34)

25 mm. As its name implies the shell is globose and purple throughout; the upper half tends to be of a lighter shade than the lower. In undamaged specimens a V-shaped notch can be noticed in the middle of the outer lip. This species attaches its capsules on the underside of the bubble float.

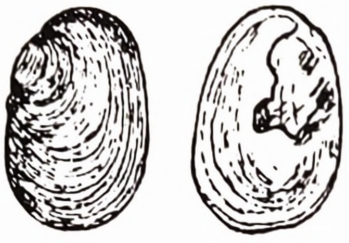
SLIPPER LIMPETS (CALYPTRAEACEA)

This group includes the *Slipper Limpets* (Crepidulae), the *Cup-and-Saucer Limpets* (Calyptraeidae) and the *Carrier Shells* (Xenophoridae).

The *Slipper Limpets* and the *Cup-and-Saucer Limpets* often have a shelf or cup-like projection internally. They are very variable in shape depending on which kind of base they settle, such as rocks or other shells.

Crepidula Walshi (Hermannsen) (Fig.35)

29 mm. A white, irregularly shaped, flat shell with an inside shelf. It is mostly found inside dead shells. Its shape may be convex or concave according to the shape of the shell on or in which it has settled. Common.



Crepidula Walshi

Crucibulum Extinctorium (Lamarck) (Fig.36)

23 mm. This species is very variable, it may be flat or elevated. Its colours, too, vary from brown to ivory white with or without brown rays. Uncommon.

Crucibulum Extinctorium

The *Carrier Shells* (Xenophoridae) owe their popular name to the animal's habit of attaching empty shells or pebbles to their shells. They have jokingly been divided into "conchologists" (shell collectors) and "mineralogists" (rock collectors) some are both. It really depends on what the snail's environment has to offer. Bits of coral are not despised either. A closer study of the arrangements of shells and pebbles shows that the snail proceeds most methodically in cementing the various items to its shell. It selects small pebbles for the small top whorls but chooses larger ones as the shell body grows. Another method is applied in the glueing of bivalve shells. It will be found that all the shells are stuck on with the inside up thereby declaring their emptiness and uselessness to any prowling hunter. Looked at from above, the Carrier shell is a perfect example of camouflage, though some zoologists are not sure that this is the purpose of the exercise. It has been observed that the snail is not only careful in selecting its building material but also makes sure that the fixing is successful. Whilst the shelly glue is produced by the snail's fleshy mantle, the animal holds the object against its shell with its snout until the glue hardens.

It must be added that only some species cover their whole shells in this way. Most of them do this only at their young stage on the early whorls.

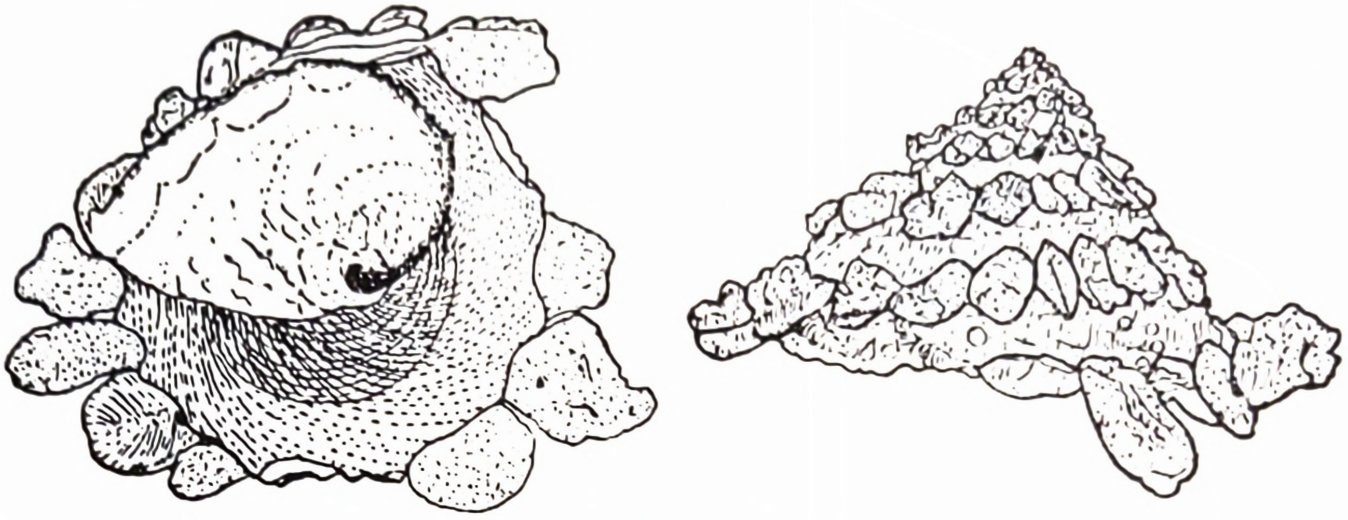
There are about 20 kinds of carrier shells which live in tropical seas in shallow as well as deep water (12-30 fathoms). They are usually found on level muddy bottom where the surface is strewn with dead and broken shells. Those from shallow water are the most enthusiastic "collectors"; they are active and move quite quickly.

The carrier shells are closely related to the wing shells (strombidae), particularly to Tibia in whose company they are often found on the West coast of India. The animal is very like a stromb but with the eyes near the base of the slender tentacles instead of being at the top of the long eye-stalks; the foot is even more conspicuously divided into two parts and equally obviously intended for scrambling over the ground at a rapid speed.

The "Carriers" method of locomotion is another characteristic of the strombs; the muscular foot is thrust out and the strong, semicircular operculum is jabbed into the sand; by pushing against this anchorage the whole animal is jetted forward in such a way that it leaps over the seabed and so avoids embedding itself. All the strombs and spider shells move in a similar fashion.

Xenophora Corrugata (Reeve) (Fig.37)

48 mm. The shell may be covered in pebbles or empty bivalves or both. Rare.



Xenophora Corrugata

Onustus Helvacea (Philippi) (Fig.38)

55 mm. The shell is very thin, delicate and rather depressed with a wafer thin edge. The surface is sculptured with close-set vertical riblets. This is one of the species which attach small pebbles or bits of shells only at the young stage and so only the first two or three whorls near the apex are covered with debris. Uncommon.

Stellaria Solaris (Linne) (Fig.39)

55 mm. Only the top whorls have pebbles or shells attached. The surface is beautifully sculpted with five beady spiral threads. The hollow protruding spines, like sun rays, begin near the apex and follow the edge of the whorls to the aperture.

"This shell was once considered a great rarity and known only from 3 or 4 specimens before the 19th century; it has now been discovered in large numbers in the waters of the Phillippine islands.

This species lives on sandy mud bottoms at depth from 100 to 1,500 feet but the nets of shrimp fishermen bring them to the surface.

The Sunburst carrier (Stellaria Solaris) was once thought to be related to the stromb conchs, but it is now known to be a distant relative of the slipper shells. The shell including the spines may reach a diameter of 12 cm. (4 in)" (Abbott).

The numerous perfectly formed projections around the edge of the whorls serve as reinforcement for the otherwise delicate shell. Very rare.

WINGED SHELLS (STROMBACEA)

The *Conch Shells* are a most interesting group of families. Their common feature is the growth of the outer lip into a "wing" which in some species is much larger than the shell body itself.

In true conches the lip grows into a plain and simple "wing" giving this family its name—*Wing Shells* or *Strombs*. In other related families, however, the broad lip develops strange outgrowths looking like "fingers" in the *Spider Conches* (Lambis), or like a bird's beak in the *Beak Shells* (Tibia).

The "winged shells" are represented in Pondicherry by ten species of which only two are common.

Wing Shells (Strombidae)

The *Wing Shells* are also called *Conch Shells, Fountain Shells* and *Strombs.* They are a family of fascinating peculiarities.

To start with there is the notch at the lower end of the "wing". This is a kind of window for the wary snail to put out its shorter right eye stalk—like a periscope—to survey its surroundings. Evidently a short stalk is pulled back to safety faster than a long one. The eyes are highly developed and have colourful rings, each species with its own colour combination.

Unlike other snails the Wing Shells do not crawl; they move by rolls and jerks. One of the largest of them, the Queen's Conch, has even been seen taking long leaps to escape a pursuer.

The animal has been described as "an intelligent mollusc". It certainly is clever enough to fight when it senses danger. Most snails when frightened will stay in the safety of their shells biding their time; but the stromb, feeling its shell being picked up, will come out and attack. At first only the saw-edged operculum will shoot out and swipe across the shell to loosen the offending grip—with instant effect in the case of an unwary collector. If this fails, head and foot will eventually come out and attack again and again until the animal is utterly exhausted, the brave little creature! If put back on the sand on its back the snail brings out its narrow and muscular foot and with the help of the claw-like operculum turns itself over in a second.

The strombs are scavengers feeding mainly on dead sea animals. They are frequently seen on the reef in sandy shallows among eel grass.

There are 80 species of strombs in the world living mostly in tropical water. The following are on the Pondicherry list:

1. **Strombus Marginatus Succinctus** (Fig.40)

50 mm. Its outstanding feature is a wide, white margin outside the outer lip, hence the name "marginatus". The other marking to look for are the four narrow white bands on a brown background with irregular, often arrow—shaped lines. The shell is long with a fairly high spire. Very common.

2. **Strombus Marginatus** (Linne) (Fig.41)

49 mm. The same white margin and white bands with pattern are found on this shell. Its shape however, is strongly conical with a sharp shoulder edge on the body whorl which in S. Succinctus is smooth and not pronounced at all. A very rare shell.

Strombus Marginatus

3. **Strombus Mutabilis** (Swainson) (Fig.42)

40 mm. This is a very variable species, as its name implies, and rare in Pondicherry though common in other places. Characteristics to look for are: Three heavy knobs on the shoulder of the body whorl; a flared and thick lip and a shallow stromboid notch. Inner and outer lip white or pink; shell mottled and spotted in light or dark browns with a white band halfway across the body whorl. Very rare.

4. **Strombus Plicatus Pulchellus** (Reeve) (Fig.43)

39 mm. The comparatively high and beautifully sculpted spire takes one third of the shell. There are four to six knobs on the shoulder and the general colouration consists of white and light brown bands of varying width. The white bands are delicately speckled. The outer lip is thick and has a wide, white margin outside as in numbers 1 and 2. The inner lip (columella) is finely grooved with brown ridges which however may be absent. Common.

5. **Strombus Auris-Dianae** (Linne) (Fig.44)

67 mm. A light-brown shell with creamy-white flecks and prominent short blunt spines on the shoulder, and below, two rows of shorter knobs. There is a short finger-like projection from the posterior (top) end of the lip and a deep stromboid notch at the other. The white callus extends the whole length of the columella almost to the apex. The lip outside has about eight pale red-brown spiral bands. The interior is orange. Very rare.

6. **Strombus Listeri** (Gray) (Fig.45)

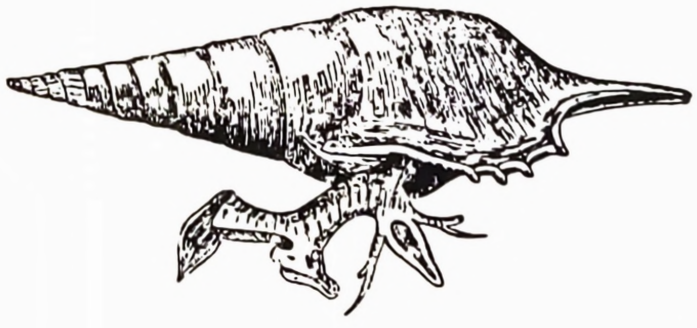
122 mm. This is a beautiful shell with a high-pointed spire and a long narrow body whorl. There are four or five hatched bands on a chocolate brown background. The spire is bluish-white with vertical brown zig-zag lines. The white, flaring lip with its rounded projection is unmistakable.

Strombus listeri seems to be confined to the Bay of Bengal. Until a few years ago this species was considered to be very rare (and therefore very expensive) because of the general ignorance of its true habitat. Today very deep dredges on muddy bottoms bring up many specimens and therefore their price has dropped considerably. On the Pondicherry coast it is still a very rare shell.

7. **Tibia Curta** (Sowerby) (Fig.46)

170 mm. The outstanding features of this shell are the five stubby little fingers on the lip and a long siphonal canal (which in Tibia fusus can grow to more than the length of the shell's body). The shell is smooth and brown.

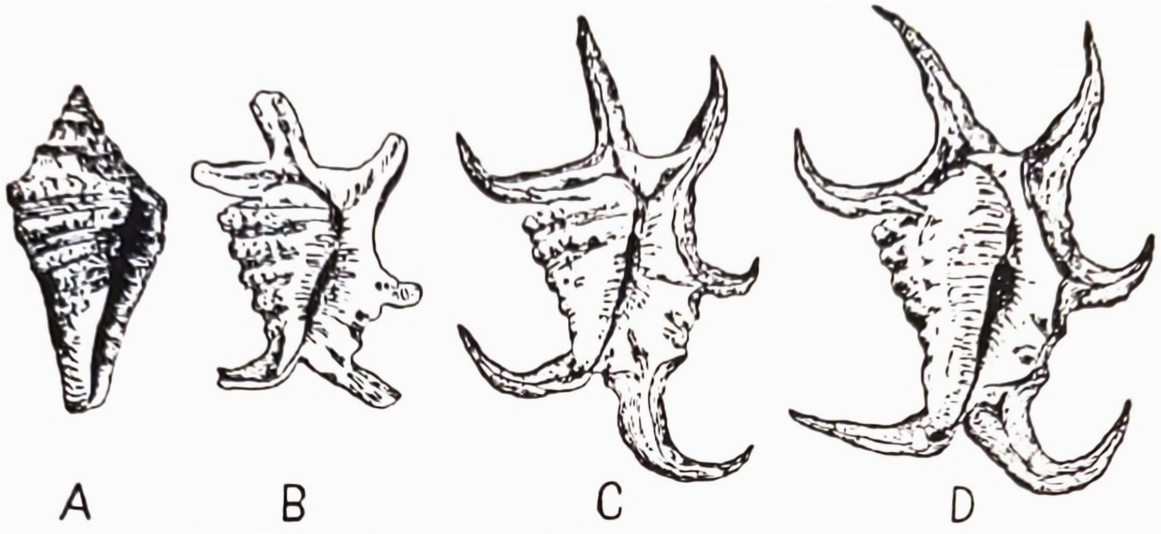
Tibia contains only six species. All are found in the ocean area between Taiwan and the Red Sea. They usually inhabit deep waters. Whilst Tibia curta is rare along the Pondicherry coast it can be abundant off the Bombay and Malabar coasts in depth between 10 and 30 fathoms (18 m —60 m).



Living appearance of *Tibia curta* Sowerby. From 25 fathoms, off Malabar. × 2/3.

Spider and Scorpion Shells

Only one species faintly resembles a scorpion and none looks like a spider. It is, of course, those finger-like growths which made these shells appear to some imaginative scientist like spiders or scorpions crawling across the reef. The young of this family are often mistaken for different species (conus or voluta) because they have no "fingers". Only after the shell is well grown the "fingers" are put on to complete it.



Growth changes in the shell of *Lambis chiragra* L. In the younger stages no 'fingers' are present. They appear later as wide, channelled projections.

The "fingers" most probably serve as "anchors" and "hooks" preventing the shell from being carried away by the waves. It has been observed that on a rocky reef, the common spider shell (Lambis lambis) has short and stubby "fingers", whereas in sandy areas they are very long and spine-like. When a wave turns over the shell the spines go deep into the sand and anchor the shell.

Most spider shells have six "fingers"; occasionally, however, specimens with seven, eight or nine fingers are found. They are considered to be "lucky" shells—lucky for the fisherman or trader who will ask any fancy price if he can find a buyer to pay it.

The spider snails live on sandy reef flats or in reef pools. They are vegetarians and feed largely on a special kind of red algae.

There are only nine species (some say 11) of this family in the world and most of them can be found along South Indian coasts. At Pondicherry only one species has been brought ashore by the fishermen and only two specimens have been seen of it. The arthritic (or gouty) spider conch (Lambis chiragra arthritica).

8. Lambis Chiragra Arthritica (Roeding) (Fig.47)

152 mm. This species is only found in the Indian Ocean. Like all spider shells it lives in shallow waters in sandy areas, covered with sparse growths of sea-weed. The two bent "fingers" can easily be caught in some of the tougher seaweeds and anchor the shell.

The operculum, or trapdoor, functions like in the other conches as a weapon as well as a lever to turn the shell when thrown on its back. The speed with which this action takes place is quite remarkable.

In Japan this shellfish is called "suijigai" because the shell is shaped like the Chinese letter "Sui" which means "water" As one of the most feared things in Japan is fire—a constant threat because of the lightly built houses—this shell is often hung up at the entrance of a house as a talisman against fire.

9. **Terebellum Terebellum** (Linne) (Fig.48)

39 mm. This is an unexpected shape for a strombus until closer examination reveals the flaring lip at the lower end of the delicate body whorl and the stromboid notch. There are three light-brown dotted diagonal bands on an even lighter brown background also dotted.

Peter Dance in his "Seashells" writes: "Terebellum terebellum burrows in sand, but it is not known if it does so for feeding purposes. When burrowing it has one or other of its stalked eyes above the sand surface, each eye taking it in turns to survey the watery world above. Although it may remain stationary for a long time, it has been seen to leap several centimetres from the ground and will do so quite unexpectedly if held in the palm of the hand". Uncommon.

10. **Varicospira Cancellata** (Lamarck) (Fig.49)

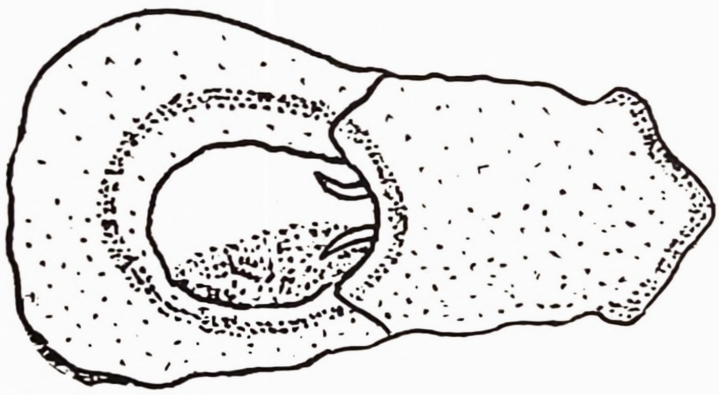
22 mm. All the whorls of this beautiful little shell are closely ribbed and the grooves between the ribs are pitted (visible only through a lens). The outstanding feature, however, is the callus on the inner lip running the whole length of the body whorl onto the next whorl and forming a long, narrow canal with the outer lip. Very rare.

MOON SHELLS (NATICACEA)

The Moon shell gets its name from its opening which has the shape of a half-moon.

The Moon shells live on sandbanks along the seashore. They are active hunters and can move at astonishing speed. All feed greedily on clams and other bivalves for which they burrow in the sand.

Life appearance of *Natica,* showing the shell sunk within the lobes of the foot. × 3/4.



View from above of *Natica* seen crawling. × 3/4. The shell and the lobes are pure white in colour save for the yellowish anterior margin of the propodium.

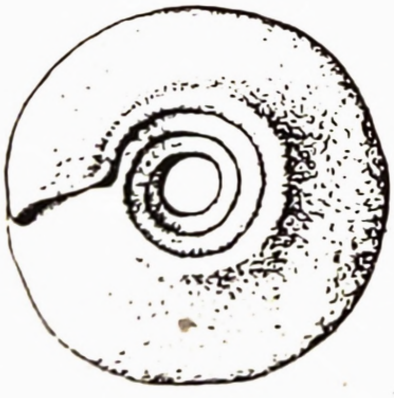
Both shell and foot of the moon snail are well adapted to its hunting methods. The lobes of the foot in front and behind the shell can be extended and spread to an enormous size by blood pressure. (Some people think the pressure is produced by a water system). In the genus *Sinum* the foot can measure six or seven times the size of the shell. By being able to change its shape as required, the foot becomes a multi-purpose tool: as a bulldozer it ploughs through the sand in search of prey, as a spade it digs, and as a vise and weapon it holds and chokes its victim.

When furrowing through the sand, part of the front lobe is folded back to protect the head, but living mostly under ground, as it were, and hunting chiefly at night, the moon snail's eyes are absent or very undeveloped; like so many other sea creatures it depends on a strong sense of smell (apart from the luck of the hunter).

The moon snail lives entirely on bivalves (shells with two valves). There are two ways of getting at their meat; one method is suffocation. The snail holds its victim firmly shut by the powerful foot to prevent it from opening and taking in fresh oxygen with a gulp of water, and so the enclosed animal will eventually choke and can be opened. The other method is more complicated: the moon snail has a tongue *(Radula)* like a file or rasp covered with rows of tiny strong teeth. Having first put a drop of acid to soften the victim's lime (calcium) shell, it uses its tongue and rasps a hole into the shell. Finally, it inserts its proboscis, or sucking tube, and injects a digestive juice which liquidises the animal inside the shell and then sucks it all out with ease.

The murderous activities of the moon shells can be noted on many an empty bivalve lying on the beach with a hole in one shell. These holes have been measured and it was found that some large Naticas made smaller holes than the smaller species. It still appears to be unknown how exactly the hole is made by the radula, whether it moves in a straight forward-backward direction or in a circular motion.

The moon-snails have separate sexes. The female lays her eggs in a jelly—like mass mixed with sand in the form of a ribbon; because of its peculiar shape this is called a *"Sand Collar"*. These egg ribbons lying on the sandy bottom are perfectly camouflaged and almost invisible. The eggs hatch in about 2-3 weeks.



Sand collar Egg-ribbon of Natica

Although moon-snails usually move under the sand or on it, they have also been observed swimming with the body upside down in Janthina fashion.

The moon shells are well represented at Pondicherry though only six species are common and the rest vary from uncommon to very rare.

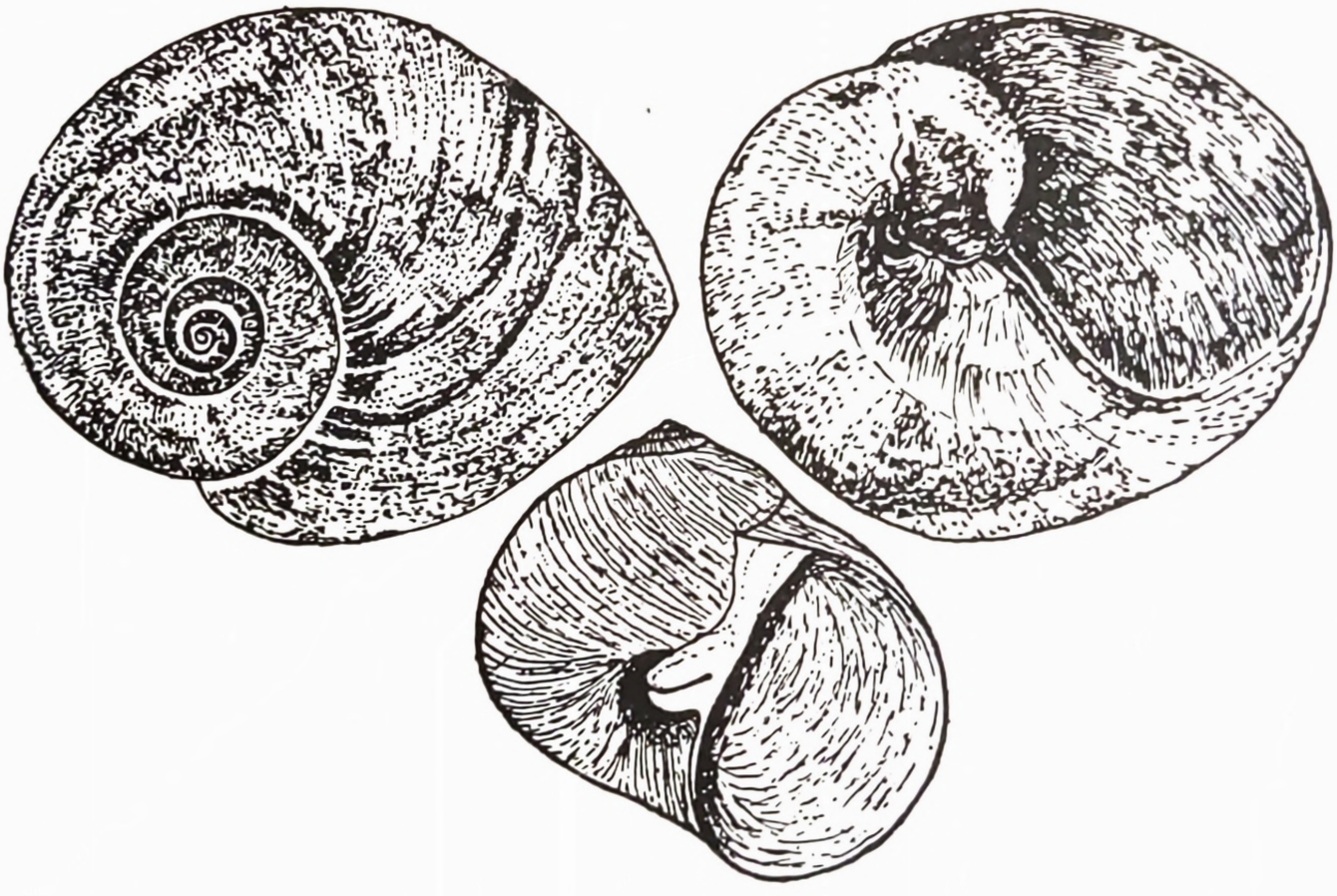
The four white species of the genus *Polinices* look so much alike that they can only be decisively identified by the callus on the base of the shell which in each case is quite distinct and unmistakable.

All members of the genus Natica are globular whereas the genus polinices is elongate and in the genus Sinum shells are flattened and ear-shaped.

A speciality of the Natica group is that their operculum, or trapdoor, is hard and shell-like, at times beautifully sculpted. The Operculum in the other genera is horny.

1. **Natica Didyma** (Roeding) (Fig.50)

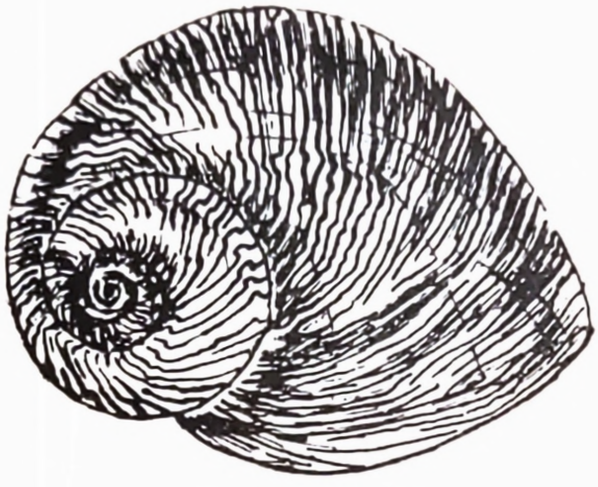
60 mm. This is the commonest of the moon shells and can be picked up in large numbers. It grows to a very large size, the average being 45 mm. The shell is glossy and fawn-coloured. The distinct marks on the base are a deep umbilicus and a chocolate brown callus with a groove across the middle.



Natica Didyma

2. **Natica Lineata** (Lamarck) (Fig.51)

41 mm. A fairly common shell with a glossy surface and marked with wavy, close-set, brown verticle lines. Though not as abundant as Natica didyma, it too can reach a large size.



Natica Lineata

3. **Natica Albula** (Roeding) (Fig.52)

37 mm. A common shell also attaining a large size. The distinguishing mark to look for is a white band, broad or narrow, around the middle of the large body whorl of a yellow-orange colour; but colouration is variable from a faint yellow to middle brown.

Natica Albula

4. **Natica Ala-Papillionis** (Roeding) (Fig.53)

26 mm. This is a very beautiful shell which can be easily identified by the two brown bands bordered by dark brown delicate dashes. Rare.

5. **Natica Picta** (Fig.54)

27 mm. Three or four white transpiral bands with a light brown "arrow head" pattern make this a unique shell. At a closer look it will be seen that the "arrow-heads" and the fine vertical lines between the bands form a zig-zag pattern. An uncommon shell.

Natica Picta

6. **Natica Gualteriana** (Recluz) (Fig.55)

18 mm. This is a uniformly grey shell with a prominent white transpiral line, starting from the apex and running to the top of the body whorl where it continues faintly to the outer lip. It is usually much smaller than 18 mm. and uncommon.

7. **Natica Tigrina** (Roeding) (Fig.56)

25 mm. A closely spotted shell with dark brown spots on a white background that cannot be mistaken. Uncommon.

8. **Natica Pulicaris** (Philippi) (Fig.57)

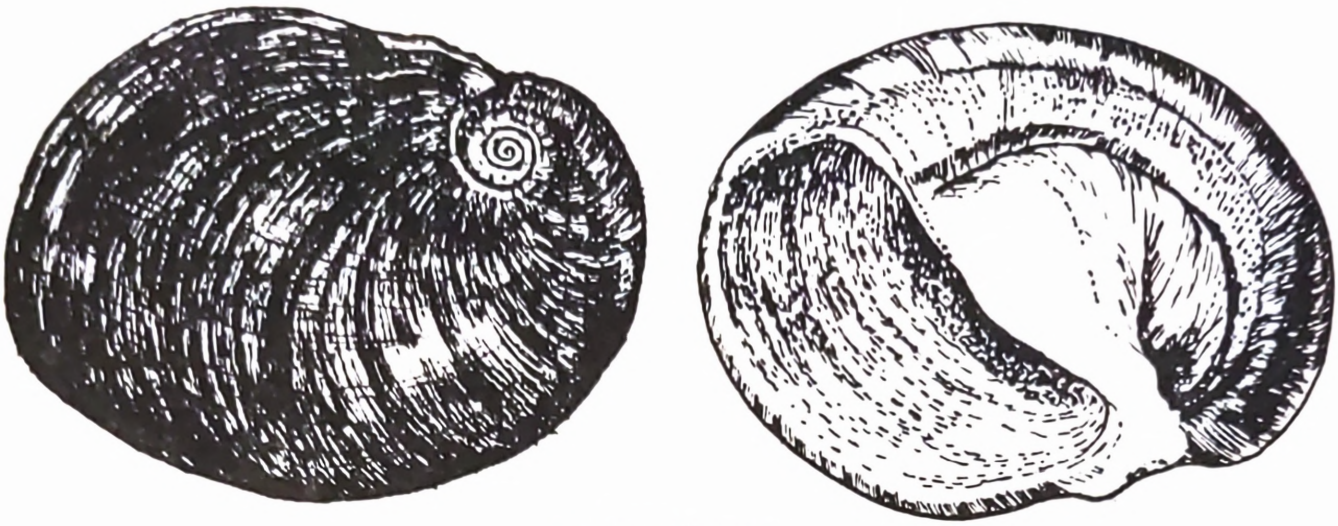
26 mm. A rare shell whose distinct markings made it easily recognisable particularly by the large blotches on the shoulder of the body-whorl reaching into a field of delicate dots. Middle to dark brown on ivory background.

9. **Natica Arachnoidea** (Gmelin) (Fig.58)

20 mm. The chief feature of this brown shell are three dark bands on the body–whorl made up of an irregular lined and netted pattern. Very rare.

10. **Polinices Albumen** (Linne) (Fig.59)

48 mm. A flattish medium brown shell with a white line around the apex. The underside is white and has a large, sharp-edged callus. Rare.



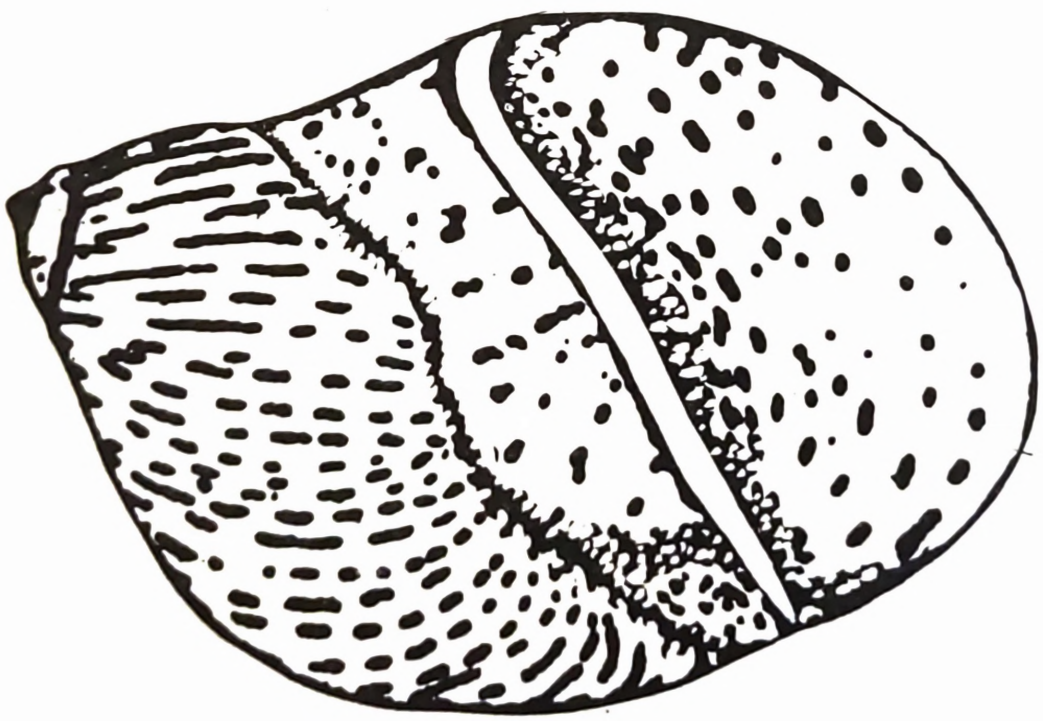
Polinices Albumen

11. **Polinices Pes-Elephanti** (Link) (Fig.60)

38 mm. A perfectly white and glossy shell which is best identified and distinguished from the other three species by the shape of its semi-circular callus surrounded by a deep groove. Common.

12. **Polinices Mamilla** (Linne) (Fig.61)

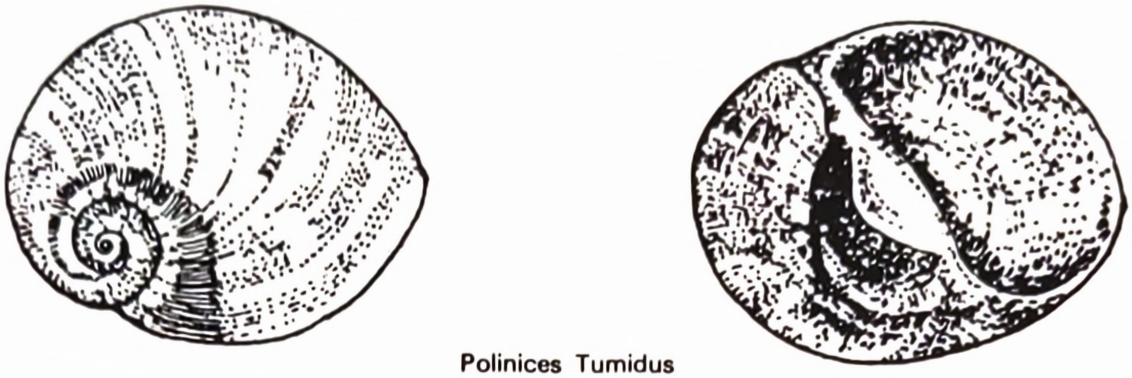
38 mm. A white and glossy shell with an elongated callus completely filling the umbilicus of the inner lip. Uncommon.



Polinices Mamilla

13. **Polinices Tumidus** (Swainson) (Fig.62)

30 mm. A white and glossy shell with an elongated callus, most of the length of the inner lip with thinning ends and bordered by a deep groove. The other distinguishing mark is a yellow line around the apex and faintly around the umbilicus. Common.



Polinices Tumidus

14. **Polinices** Sp.

31 mm. A white and glossy shell with a callus wider than in polinices tumidus. One end thinning towards the lip and the other end widening towards the bordering deep groove. Yellow line missing! Very rare.

15. **Polinices Melanostomus** (Gmelin) (Fig.63)

35 mm. This shell is easily recognised by its two wide brown bands each covering about a third of the body whorl. Another feature is the dark brown callus along the length of the inner lip. Common.

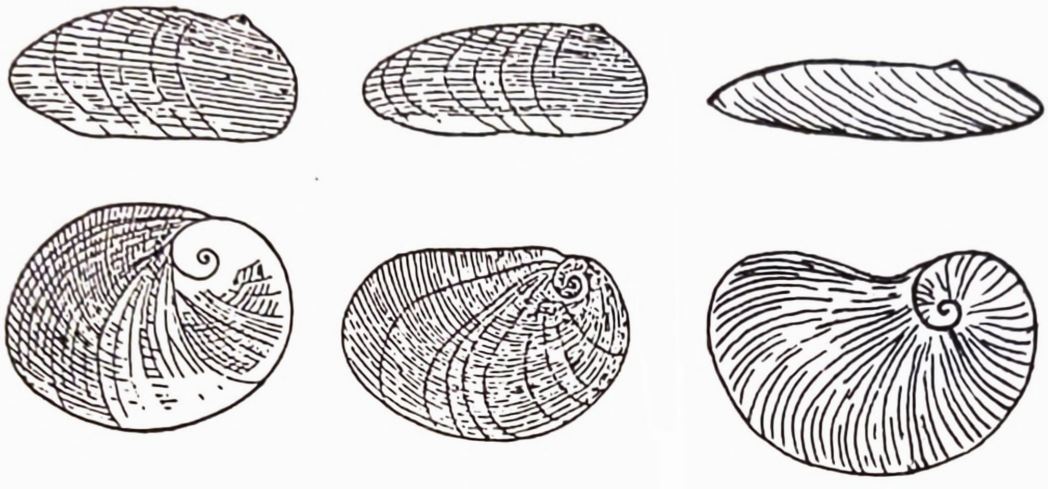
Polinices Melanostomus

16. **Polinices Melanostomoides** (Fig.64)

40 mm. In shape this shell is similar to number 15 but wholly white with a few brown dots along the top line of the whitish band on the preceding shell. As several more specimens even without dots have been collected it will appear that this is a separate species. Rare.

17. **Sinum Neritoideum** (Linne)

33 mm. This and the next specimen can easily be confused. There are two distinguishing features for this shell: 1) The general shape is roundish and strongly convex. 2) It has no brown apex like number 18. Uncommon.



Sinum Neritoideum

Sinum Cuvierianum
From behind and from above

Sinum Planulatum

18. **Sinum Cuvierianum**

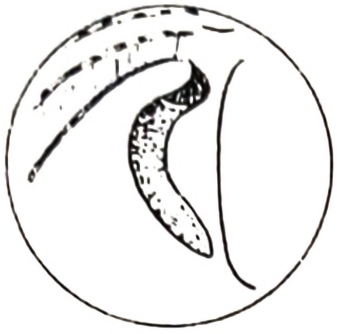
31 mm. This is a distinctly elongated and flattish shell. The apex is brown. Rare.

19. **Sinum Planulatum**

21 mm. Longish and as its name implies very flat. The apex which somehow stands out in all other species of this genus, is completely level with the surrounding shell surface. Very rare.

Sinum Planulatum on the move

Umbilicus of each natica species mentioned :

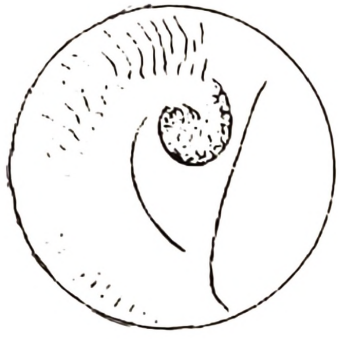


Natica Ala-Papilionis

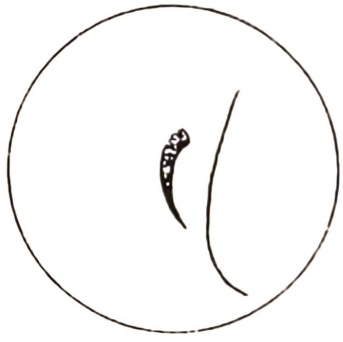
Natica Albula

Natica Arachnoidea

Natica Didyma

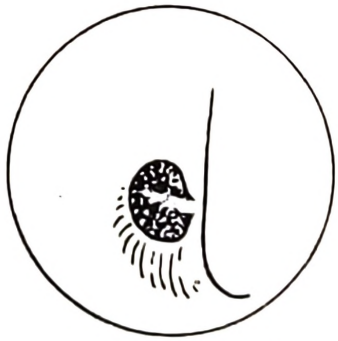


Natica Lineata

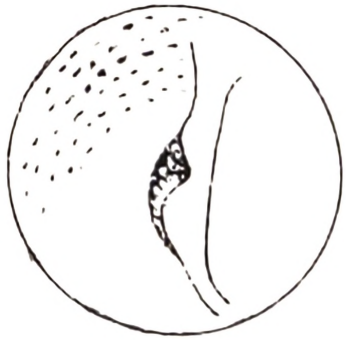


Natica Gualteriana

Natica Picta



Natica Pulicaric



Natica Tigrina

The number of cowry species found on the Indian coasts has not yet been established but is likely to run into several dozen; of these 13 species can be recorded for Pondicherry, but most of them are rare. Their habitat remains a secret yet to be unveiled, though the "old pier" was discovered as the abode of Cypraea Arabica and Cypraea Ocellata.

1. **Cypraea Ocellata** (Linne) (Fig.65)

29 mm. This is the commonest of the local cowries; light-brown with whitish spots of which some have a black centre; the margins of the shell are pinkish-white with dark-brown spots which extend to the base becoming lighter. The outer lip has strong, brown teeth. Note the grey dividing line along the back. Very common.

Cypraea Ocellata

2. **Cypraea Onyx** (Linne) (Fig.66)

45 mm. This is a beautiful brown shell at times appearing to be almost black. The whole surface is of this colour with the exception of the reddish-brown teeth. There are, however, some misleading variations: The shells of juveniles are a light brown with two beige bands across the back, giving the impression of a different species. A close examination of the mature specimens will detect the existence of these bands there, too. Uncommon.

Cypraea Onyx

3. **Cypraea Lamarcki** (Gray) (Fig.67)

41 mm. At first glance this shell looks like an overgrown C. Ocellata, but the missing black "eyes" correct the mistake. The second feature to look for are the brown teeth which in C. Lamarcki are white like the whole of the base. Rare.

4. **Cypraea Pulchella** (Swainson) (Fig.68)

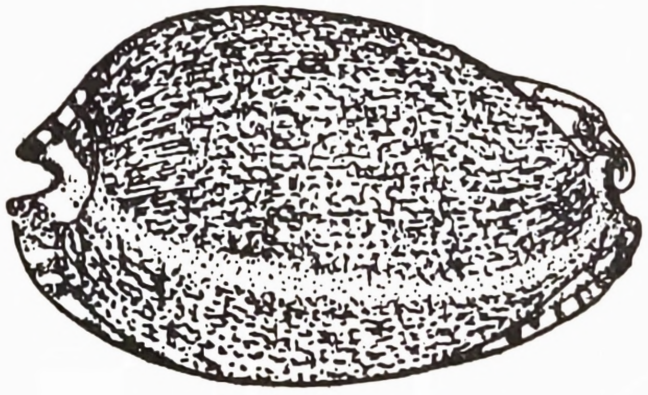
35 mm. The shell is generally very lightly speckled though dark variations occur. The main features are a light brown band across the back on which will be found one large chocolate brown blotch and another often much longer on one side; there are some large spots along the margins and strong, dark-brown teeth on a creamy base. Uncommon.

5. **Cypraea Caurica** (Linne) (Fig.69)

41 mm. The elongate shell is heavily stippled with tiny brown dots on a greenish-yellow background forming a dark blotch on the back. The fawn-coloured margins have some large brown spots; the base too is fawn, but the teeth are of a lighter shade. In the local variation three dorsal bands exist but are barely visible. Very rare.

6. **Cypraea Arabica** (Linne) (Fig.70)

67 mm. Specimens are very variable from brown dots to interrupted lines faintly resembling Arabic writing. The margins are pinkish-fawn with large brown spots; the base is of the same colour but plain with reddish-brown teeth. Very rare.



Cypraea Arabica

7. **Cypraea Histrio** (Gmelin) (Fig.71)

54 mm. The distinctive feature of this species is the pattern on the back; it consists of a net of irregular shapes. The base is white with moderately strong brownish teeth. Very rare.

8. **Cypraea Mappa** (Linne) (Fig.72)

58 mm. The general pattern is similar to C. Arabica only much more delicate. The chief feature to note is the marking along the back of the shell reminiscent of a river with many bends (hence "mappa" - The map cowry). The base is a rich pink and has an orange aperture. But the colouration of this species is very variable and the main means of identification is the "river" pattern. Very rare.

9. **Cypraea Nivosa** (Broderip) (Fig.73)

55 mm. This is another extremely rare shell, grey and brown in colour with many whitish spots and blotches. The margins are a light fawn, the base and teeth off-white. Very rare.

10. **Cypraea Carneola** (Linne) (Fig.74)

35 mm. This species is easily identified by its pale pink-brown back with four darker bands; the margins are a light fawn and the teeth bright purple. Very rare.

Cypraea Carneola

11. **Cypraea Erosa** (Linne) (Fig.75)

33 mm. Three features define this particular shell: the brownish-green back profuse with white dots and a few larger brownish spots; a brown band whose ends become visible on the margins and ending half-way on the columella, and a white base. Very rare.

12. **Cypraea Pallida** (Fig.76)

28 mm. The shell is about twice the size of C. Ocellata; the surface is of a greenish tinge speckled with fine brown dots, and a brown blotch on the back. The margins are a light fawn with brown spots; base and teeth are white. Very rare.

13. **Cypraea Moneta** (Linne) (Fig.77)

13 mm. A specimen of the many subspecies and variations of "Moneta" is a rare find at Pondicherry. Its back is a light grey or yellow surrounded by a broad, knobbed margin.

Cypraea Moneta

Whole books have been written on the Money Cowry (C. Moneta). As its name implies, it was used as currency thousands of years ago in many tropical countries. In China, for instance, the origin of the Chinese character meaning "treasure" is shaped after the money cowry. Other characters related to treasure such as jewel, coin, wages, (to) lend, save, property, etc. all contain the character meaning "Cowry".

When copper coinage was introduced in China to take the place of cowries, many forgers got busy to such an extent that the country was flooded with debased coins. As a result money cowries were reintroduced until a better way of minting coins was found.

In India the story of the money cowry goes back into dim antiquity. One *Pana* — " a handful"— amounted to 80 cowries; this was the standard from which all subdivisions were made. Although cowries were used in small transactions throughout India, special reference can be found to the Portuguese trade between the Maldive Islands, and Bengal. Shiploads of rice were taken from Hooghly to these islands and exchanged for cowries. The shells were then taken back to Bengal where they fetched a high price.

Since many parts of India were chronically short of small change, the use of money cowries went on into the 20th century. At Shahpur, Sarghoda District, for instance, the rate of exchange in the 1920's was 960 cowries for one rupee. One cowry bought 2–3 dates, two cowries a bunch of spinach, and for 4–5 cowries 2 radishes could be had.

The money cowry also entered the different languages. Thus in Hindi a valueless person is described as *"Ek Kauri Ka Admi Nay"* ("This man isn't worth a cowry"). In Bengali *"Thaka Kori Nay"* simply means "I have no money, large (Thaka) or small (Kori)".

A long story could be told about this shell alone, but a last reference must suffice. In some illustrations the goddess Lakshmi is surrounded by shells at her feet and among them, of course, a cowry—a symbol of wealth.

The False Cowries (Ovulidae) are related to the true cowries. Two species are represented at Pondicherry:

14. **Volva Volva** (Linne) (Fig.78)

85 mm. This unusual white shell, aptly nicknamed a "weavers shuttle", cannot be mistaken for anything else. In "live" specimens the ends of both canals are pinkish-red. Rare.

Volva Volva

15. **Volva Sowerbyana** (Weinkauf) (Fig.79)

A miniature Volva Volva though the siphonal canals are much shorter. The shell is a dark fawn with a creamy outer lip and a light-fawn band around the body whorl. Very rare.

Volva Sowerbyana

HELMET SHELLS (CASSIDIDAE)

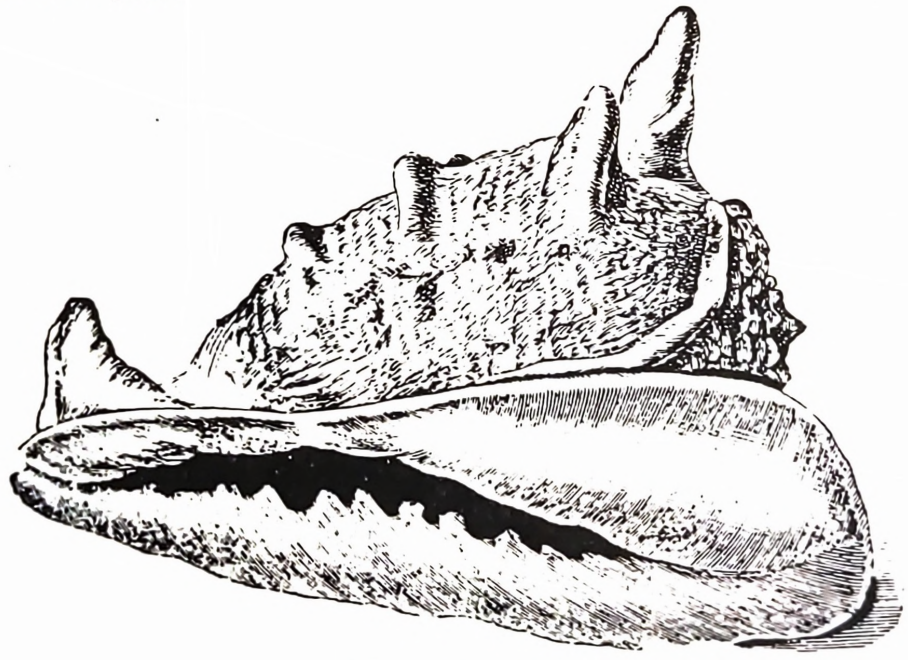
The large, heavy *Helmet Shells* live in tropical waters round the world. There are less than a dozen species and in Pondicherry they are represented by *Cassis Cornuta* (The Great Helmet Shell).

The shell of the Great Helmet consists of differently coloured layers of which the cameo carvers of Italy made good use. The top layer would be used for carving the actual design whilst the lower layers served as contrasting background. Different species provide different colour combinations.

The Great Helmet shell feeds on the long-spined sea-urchins (Diadema setosum) by first crushing the poisonous spines with its tough foot and then piercing the urchin's shell with its long proboscis.

1. **Cassis Cornuta** (Linne) (Fig.80)

22 cm. The outstanding features are the large, horn-like knobs on the shoulder which give the shell its Latin name: meaning *The Horned Helmet.* It is the largest and heaviest of the Indian sea snails, its shell weighing several pounds. These great shells are rare and are usually found in depths of 8 to 10 fathoms; it is therefore not surprising that only two live specimens were collected at Pondicherry in the course of one year.



Cassis Cornuta

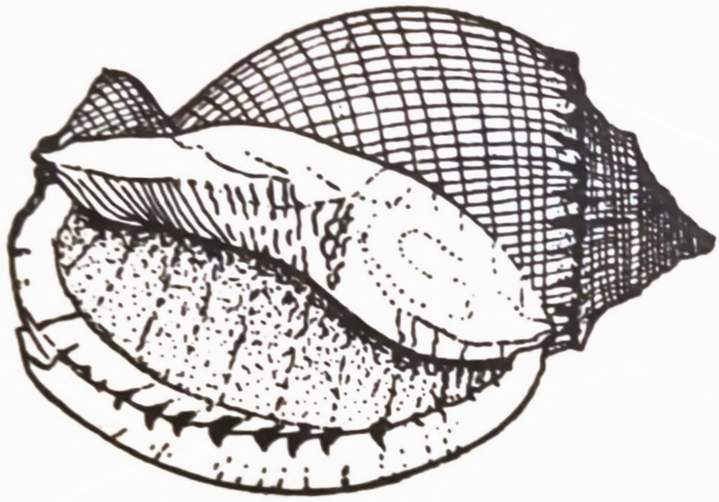
Bonnet Shells

Closely related to the Helmet shells are the *Bonnet shells* (genus *Phalium)*, a kind of small helmet. They get their name from a vague resemblance to the ladies' headgear worn some 150 years ago.

2. **Phalium Glaucum** (Linne) (Fig.81)

82 mm. This is the largest of the Bonnet shells easily recognised by its uniformly grey colour and a row of small knobs on the shoulder and smaller ones on the next whorl. On the lip outside are the ends or beginnings of five brown bands. The outer lip is toothed and often of a beautiful orange colour. The columella is completely covered by a transparent callus. In the juveniles the shoulder knobs only are developed; the whole shell has spiral grooves and even a hint of "netting" which are lost as the shell grows bigger.

Occasionally specimens are found with a varix on the left side of the shell. Very common.



Phalium Glaucum

3. **Phalium Bisulcatum** (Schubert and Wagner) (Fig.82)

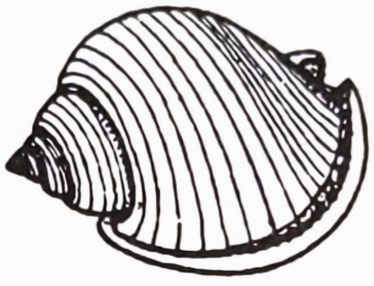
40 mm. The distinguishing feature of this shell are four rows of brown squares on a slightly grooved shell surface. (The grooves are similar to those on the young Phalium glaucum).

The brown squares seem to continue on the lip where they are separated by white bands. The top is thickened and strongly toothed. The whorls of the apex are separated by a deep canal.

Like in Phalium glaucum, specimens with a varix are found, sometimes more or less on the left side of the shell; at times it is near the lip as if the snail finished making its shell but then changed its mind and carried on for another 15 mm. Very common.

4. **Phalium Canaliculatum** (Brugieres) (Fig.83)

50 mm. The shell is almost exactly like P. Bisulcatum except that it is completely off-white with only a hint of the brown squares on the lip. The whorls of the apex are closely joined and not separated as in the previous species. Common.



Phalium Canaliculatum

5. **Phalium Areola** (Linne) (Fig.84)

60 mm. A beautiful shell with unique marking requiring no description in addition to the illustration. At a first glance only it might be mistaken for Phalium bisulcatum.

Note the glassy callus through which the pattern is perfectly visible. All shells have a banded varix on the left side of the shell. Uncommon.

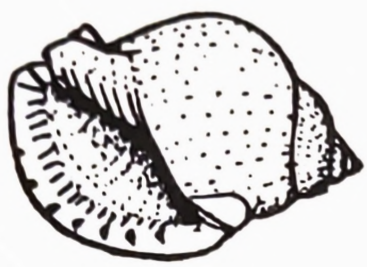
Phalium Areola

6. **Casmaria Ponderosa** (Gmelin) (Fig.85)

38 mm. This is one of the prize finds on the Pondicherry beach. It is easily distinguishable from the other casmaria by the two rows of dark-brown square markings around the top and bottom end of the body whorl. An additional feature in more mature specimens are the knobs which are absent on the shoulder of small and juvenile shells. Rare.

7. **Casmaria Erinaceus** *Var.* **Vibex** (Linne) (Fig.86)

46 mm. Absence of the square blotches and shoulder knobs clearly distinguish it from Casmaria ponderosa. A very rare shell.



Casmaria Vibex

FIG SHELLS (FICIDAE)

The *Fig Shells* are so named because their shape resembles that of the fruit of a fig tree, especially the shell with a short siphonal canal. Their shells are thin with a very low spire but a wide aperture.

The appearance of the fig shells has been called "uninspiring" though not lacking "a certain elegance", but the beauty of the animal cannot be argued. It is one of the puzzles of the shell world where some shells are most beautiful yet the animals are dully coloured whilst others, like the "figs" are dull with most attractive creatures. Why? Why? Why?

The habits of the fig shells are the same as those of the Tun Shells; they live on sandy and muddy bottoms not far below low-tide mark.

Like the "tuns", the "figs" are carnivorous. The acid contained in their snouts indicates the mode of dealing with the prey. The acid softens the sea-urchins shell and allows the radula (file tongue) to drill a hole. The long proboscis leaves no doubt about its use once the hole has been drilled.

Living in a muddy place, the "figs" have, like other mud dwellers, a very broad foot which prevents them from sinking into the mud and enables them to crawl along smoothly and quickly. It is particularly wide in this genus, and both the upper surface of this foot and the mantle folds that more or less enwrap the back of the shell are beautifully veined.

The fig shells are only a small family; four species can be recorded for Pondicherry. Two species are easily distinguishable but the other two can be troublesome.

1. **Ficus Gracilis** (Sowerby) (Fig.87)

137 mm. The "elegant" and graceful shape of the shell rightly inspired the name; a large light-brown shell with a long siphonal canal with many flat spiral cords and zig-zag lines the whole length of the shell. Very rare.

2. **Ficus Ficoides** (Lamarck) (Fig.88)

45 mm. The light-brown shell is rather elongate with a strongly netted surface, five or six narrow ivory coloured bands, with dark-brown dots and dashes, and some dark blotches on the other parts of the shell. Uncommon.

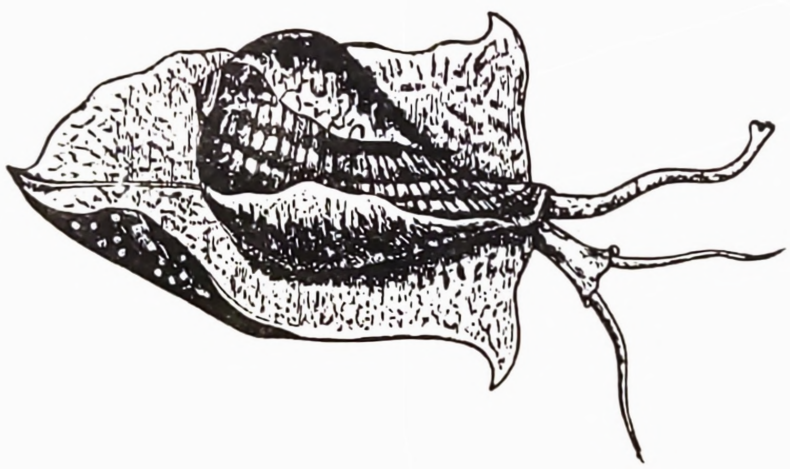
3. **Ficus Subintermedius** (D' Orbigny) (Fig.89)

68 mm. The two following shells are extremely difficult to distinguish on account of the many pattern variations. Generally speaking, it can be "suspected" that shells with very delicate dotting and dashing along the white bands belong to

the species Ficus subintermedius. Another characteristic to look for through the magnifying glass is the sculpting: the spiral ridges are low and the vertical ridges are almost invisible creating the effect of a most delicate network. Very common.

4. **Ficus Ficus** (Linne) (Fig.90)

67 mm. Higher spiral ridges and consequently deeper grooves as well as much more pronounced vertical ridges give the shell surface a strongly netted character. Also notable is the beady effect caused at the crossing of horizontal and vertical ridges. The large blotches on the white bands are another distinguishing feature. Very common.



Life appearance of *Pyrula ficus* L. ; note the large flattened foot and the mantle folds enwrapping the shell. (After Owen.)

TUN SHELLS (TONNIDAE)

The *Tun Shells* are a small family. They have thin, rather fragile shells with a widely expanded body whorl and a short spire. The largest of them, the *Giant Tun* (Tonna galea) can have a diameter of more than 20 cm. An Australian species—Tonna Cerevisina - has been nicknamed the "Beer barrel" because a large specimen can hold over 2 litres of liquid.

The "Tuns" live mostly on sandy areas beyond the reef but have also been found in shallow water on muddy bottom; like the "Figs", the "Tuns" too have a large foot to slide safely across soft ground without sinking into the mud. Indeed the animal is usually larger than the shell.

The Tun Shells are carnivorous and feed on echinoderms, especially Sea-urchins, and crustaceans; like the Moon Shells, they use acid to soften a Sea-urchin's shell and then drill or file a hole to insert the long proboscis (or sucking tube); an urchin's spines do not seem to bother them at all.

Only three species of "Tuns" are known from Pondicherry :

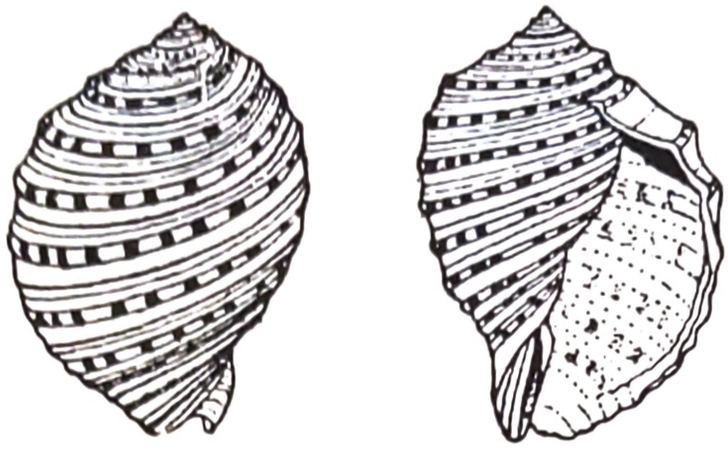
1. **Tonna Galea** (Linne) (Fig.91)

23.5 cm. Although it seems that during 1987 no specimen of this shell was caught in the net of a Pondicherry fisherman, specimens have been recorded for previous years. But all shells were "dead" and damaged and can easily have been brought by currents from the south. At Cuddalore, for instance, large live specimens are caught in the fishing nets. (*Note* : One live specimen was found at the end of the year.)

The Giant Tun has a very big body whorl with broad, flat ridges between broad and flattish grooves. These grooves may have secondary smaller ridges, particularly in the upper half of this whorl. If found "live", the shell will be covered by a brown, flaky periostracum, or skin, which covers a brown shell with irregular whitish brown blotches.

2. **Tonna Dolium** (Linne) (Fig.92)

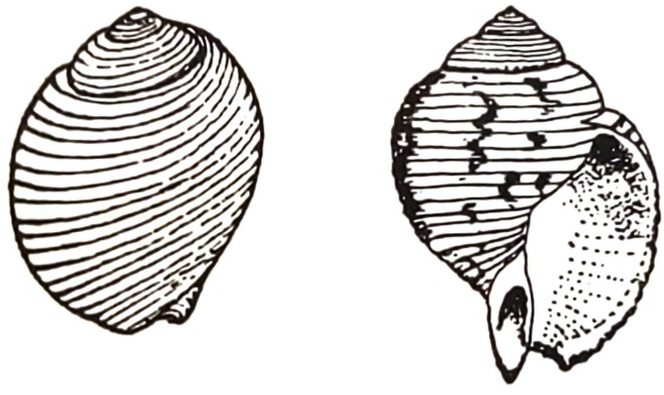
98 mm. All Tun Shells are heavily ridged and grooved as also seen in this shell. The wide ridges between wide grooves are marked with brown blotches. The colours on live specimens seem at times faded for the simple reason that the shell is covered in a thin, yellowish, flaky skin (periostracum). Very common.



Tonna Dolium

3. **Tonna Cumingii** (Reeve) (Fig.93)

80 mm. This shell can be identified by its close-set 20 or 21 shallow spiral grooves. The shell is pale chestnut brown, irregularly marked all over with clouded white and dark brown patches. Uncommon.



Tonna Cumingii

HAIRY TRITONS (CYMATIIDAE)

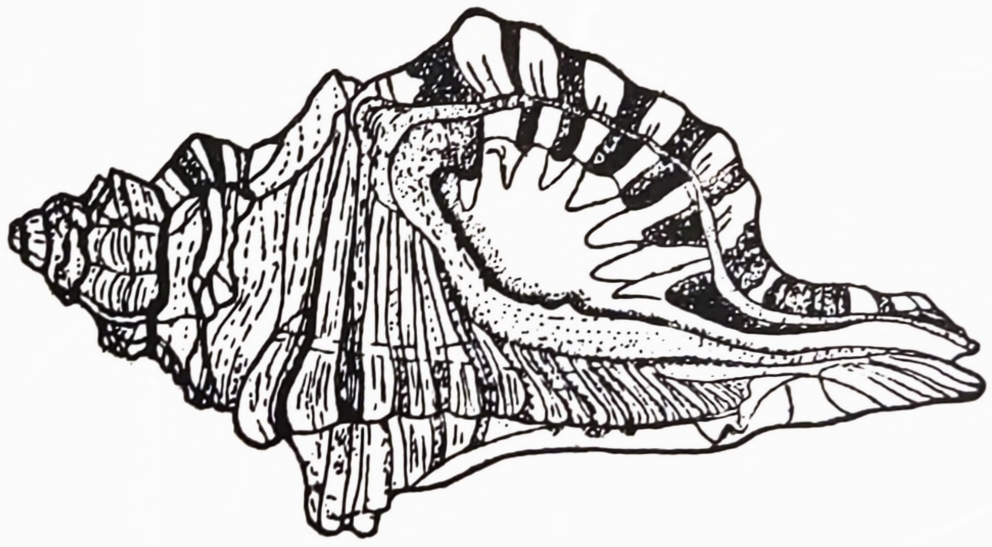
The *Hairy Tritons* are marked by prominent shoulders, raised spiral ribs and heavy knobs and varices; but their outstanding feature is a thick skin (periostracum). This is sometimes furry (like in *Biplex* tubercularis), sometimes covered in rows of single "hairs" (Distorsio reticulata) or in vertical rows of "tufts" like additional varices (Cymatium pileare). The periostracum is in fact so thick that the shell's feature and colour pattern are almost completely hidden.

The Hairy Tritons live in shallow and deep waters of tropical regions. They are carnivorous and feed on other molluscs and echinoderms like Sea-urchins.

There are about 100 species of Hairy Tritons of which eleven are represented at Pondicherry:

1. **Cymatium Perryi** (Linne) (Fig.94)

123 mm. This is one of the prize shells to be landed. Their usual appearance is rather deceptive because they tend to be completely encrusted with a thick layer of calcium, algae and worm shells; only long and hard work will reveal the beauty



Cymatium Perryi

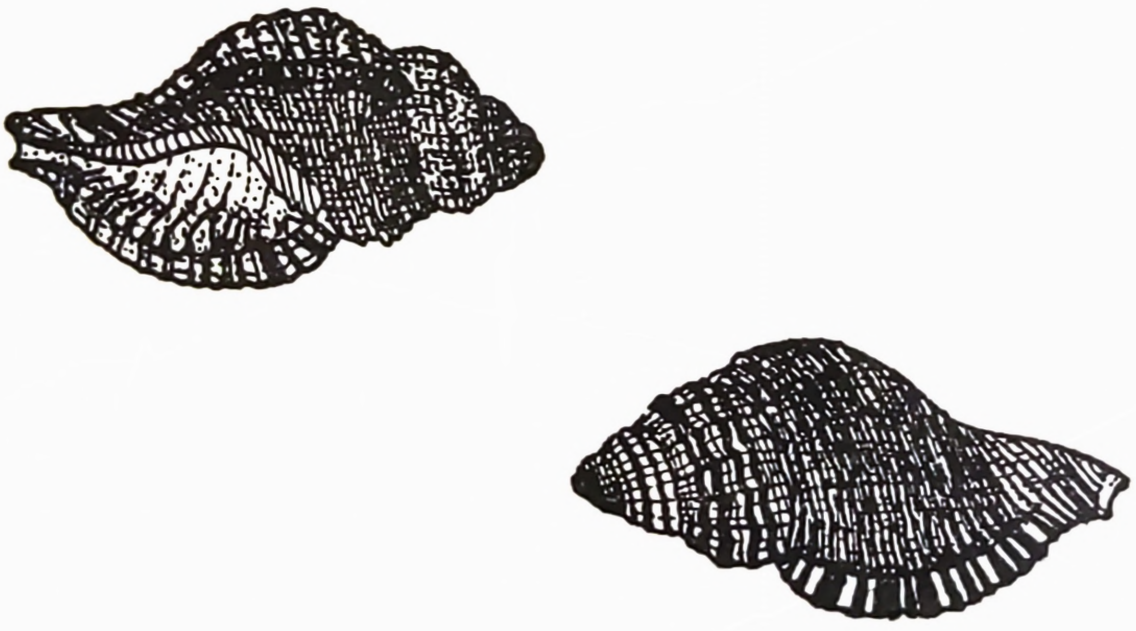
of the orangy-brown shell; its outstanding features are three large, rounded knobs on the shoulder. The strong varices have chocolate brown bands. The outer lip is the thickest varix with the brown bands running into the outer lip forming seven orange-brown strong "teeth". The callus on the columella (inner lip) has an orangy edge. (Note that the main difference between this species and Cymatium lotorium is the absence of brown marking on the columella). Rare.

This genus has been given a certain holiness in Hindu ritual like the sacred chank. When looked at its back, the shell is not unlike the front view of an elephant's head, the siphonal canal forming the trunk and the apex being the crown often seen on an image of Ganesha. A similar impression may be had by looking at the shell from the side. It has therefore come to symbolize Shiva's elephant-headed son and finds its place in a puja room.

(The trio of "Sacred" shells consists of Turbinella Pyrum) (the sacred chank), Cymatium Perryi (no English name) and the Bullmouth helmet shell (Cypraecassis rufa); the last, too, is also reminiscent of an elephant head's profile and therefore sacred to Ganesha.)

2. Cymatium Pileare (Linne) (Fig.95)

71 mm. A "live" shell would be completely covered with a brown periostracum and vertical rows of tufts of "hairs". These are particularly strong on the thick, varix-like lip and on the varix on the opposite side. The cleaned shell, however, reveals a surface of spiral beaded ridges and intermediate threads. The general colour varies from light to dark brown with vertical streaks on the body whorl and a creamy spiral band about the middle. The lip is thickened into a varix with dark and light brown bands. A similar varix is found on the left side of the shell. The outstanding feature, however, are the eight pairs of white teeth on an interior background of a rich red, and an inner lip of the same colour, and white folds the whole length of the columella. Rare.



Cymatium Pileare

3. **Cymatium Tripus** (Lamarck) (Fig.96)

70 mm. In this strongly knobbed, light-brown shell the body whorl and the next two whorls above are distinctly separated by a wide groove. There are four knobs on the shoulder each one almost forming a varix. The clearly raised heavy ridges are widely separated and end on the varix-like lip. The grooves are beaded and netted. A whitish spiral band runs across the middle of the body whorl. The outer lip shows a marked angle at the shoulder level. There are seven white "teeth" on a purplish-white interior and white folds or ridges also on a purplish-white inner lip are distinct features of this species. Uncommon.

4. **Cymatium (Ranularia) Pyrum** (Linne) (Fig.97)

53 mm. The "live" shell is covered by a middle-brown periostracum with verticle lines of single "hairs" across the knobs and along the varices.

The cleaned shell is light brown with a creamy band along the shoulder ridge interrupted by brown knobs. The strongly raised beady spiral ridges are separated by beaded or netted grooves all beautifully sculpted. The lip-varix is not solid like in other genera of this family, but folds over making a hollow space between it and the seven "teeth" which actually are the undersides of the grooves. The spire is comparatively short. Very rare.

5. **Cymatium Cingulatum** (Lamarck) (Fig.98)

65 mm. A distinct feature of this shell is the outward flaring lip which might almost qualify it for the strombus family, but this is missing in juveniles. The ridges are smooth and shiny, and the grooves narrow, shallow and equally smooth. The whole shell is creamy white and a very light brown with vertical brown streaks. In juveniles a whitish band around the middle of the body whorls is still visible which later disappears. The lip is delicate and strongly toothed, each tooth being the end of a groove. Rare.

Cymatium Cingulatum

6. **Cymatium (Ranularia) Retusum** (Lamarck) (Fig.99)

47 mm. This is a shell with a short spire and a long siphon. The surface is covered with spiral ridges alternately wide and narrow with knobs on the shoulder and at times on the lower ridges as well. The grooves have at the lip end dark brown markings. The outer lip has seven pairs of "teeth" though occasionally these may be single. The white columella shows many folds. Rare.

7. **Cymatium Muricinum** (Roeding) (Fig.100)

44 mm. The body whorl has six varices crossed by six rows of knobs which are larger on the shoulder. The fairly long siphonal canal bends backwards. The strong outer lip and the columella are entirely covered by a white enamel. The colouration of the body whorl is a delicate grey-brown mottled with a hint of two brown bands, the spire is yellowish-white, the interior purple brown. Very rare.

8. **Cymatium** Sp. (Fig.101)

37 mm. This almost globular shell has flat ridges and wide grooves finely sculpted by very thin vertical ridges from the apex to the siphon. The outer lip is thick and beautifully toothed with reddish-brown marks. Very rare.

9. **Gyrineum Natator** (Roeding) (Fig.102)

42 mm. This is a pretty little shell once the fuzzy periostracum has been removed. All the whorls are slightly flattened, each with a pair of varices. They are ornamented with spiral rows of close-set rounded knobs. There is a white band around the body whorl and a white middle ridge on the varices. On the outer lip are seven "teeth" set far apart. This shell is at first glance easily confused with Bursa granularis, but the missing posterior (upper) siphon makes it a member of the Hairy tritons. Common.

Gyrineum Natator

10. **Biplex Bitubercularis** (Lamarck) (Fig.103)

42 mm. A brown and fuzzy skin hides the only feature one has to look for in this Shell: two brown blotches on the upper (dorsal) side and two or three brown blotches on the underside. Uncommon.

11. **Distorsio Reticulata** (Roeding) (Fig. 104)

64 mm. A furry skin with rows of single "hairs" covers the shell. A bulge in the whorl above the body-whorl causes a slight distortion in the shape of the shell (hence "Dis-torsio"). When cleaned, the vertical ridges crossing the spiral ridges create the impression of a netted surface of a creamy-white colour. The sharp lip can be very extended in larger specimens. There are nine or ten "teeth" and one large tooth at the top of the inner lip. A feature of the "distortions" is the large notch in the columella and the delicate folding on its lower part. The callus usually covers the whole of the outer lip and columella, and is a beautiful reddish-pink; unfortunately the colour fades quickly on the "dead" shells. Common.

FROG SHELLS (BURSIDAE)

The *Frog Shells* were given this name because they have a likeness, seen from the side, to tiny tree frogs squatting head up, ready for a leap. They look even more like warty toads.

The Frog shells are close relatives of the Hairy tritons and can easily be confused. The distinguishing feature in "Frogs" is the presence of a second, posterior siphonal canal at the top of the aperture. The anterior channel at the lower end is used for sucking in water over the interior gills, and the posterior one is the outlet for waste and used water.

In general appearance the "Frogs" are heavily knobbed, like the Hairy tritons and have strong varices the whole length on each side of the shell. These have probably a strengthening effect on the shell structure.

There are about 60 species of tropical Frog shells ranging in size from 12 mm. to 250 mm. The largest of them was used as an oil lamp with the fitting Latin name Bursa Lampas (now Bursa Bubo).

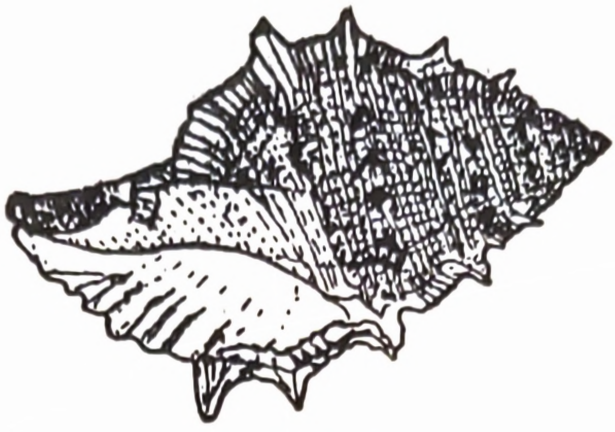
The "Frogs" live in tropical seas among the rocks and coral in the shallow waters of the lagoon. They are carnivorous and useful scavengers and have been seen swarming in crowds upon dead fish thrown ashore.

It is somewhat unusual that the Frog shells are frequently found in pairs sheltering under coral rocks.

Out of the seven species of Frog shells seen at Pondicherry five are so alike in their general appearance and confusing variations in their growth stages that they need close examination.

1. **Bursa Spinosa** (Lamarck) (Fig. 105)

85 mm. A fully grown specimen is recognised by its long shell, the long and sharp spines on both varices and the two extra long ones on either side. The second characteristic is the middle section on the underside of the body whorl between the two rows of knobs ; the spiral ridges are rounded and smooth without any interruption whereas in Bursa Rana the same ridges are strongly beaded; the outstanding yet barely noticeable feature is the spine hidden behind the posterior (upper) siphonal canal which is absent in B. Rana. In fact, by this last sign alone it would be possible to distinguish between the two species. Uncommon.



Bursa Spinosa

2. **Bursa Rana** (Linne) (Fig.106)

65 mm. The shape of the orangy-brown shell is much rounder than B. Spinosa. The spiral ridges on the whole shell surface are beaded throughout; the spines on the varices are of equal length; but the chief point to remember is the missing spine behind the posterior canal. Uncommon.

3. **Bursa Crumena** (Fig.107)

70 mm. Though in shape very much like B. Rana, it differs in having fin-like and sharp-ridged varices without the spines. The surface is covered in spiral ridges of whitish beads on a middle-brown background; The flat knobs on the shoulder have dark brown blotches; the other two or three rows of short spines on the lower half of the body whorl are joined by dark brown dashes. The "fins", the beads and the brown blotches and dashes are all that is needed for identification of Bursa crumena. Common.

4. **Bursa Margaritula** (Deshayes) (Fig.108)

37 mm. This is just another confusing species, but also has its clear distinguishing marks, which set it apart from the others; on the dorsal (upper) side there are three flattish rounded knobs on the shoulder with a brown dash across each; the varices are thick and rounded unlike in any other of the preceding species. The colour of the shell is a blotchy light-brown. Rare.

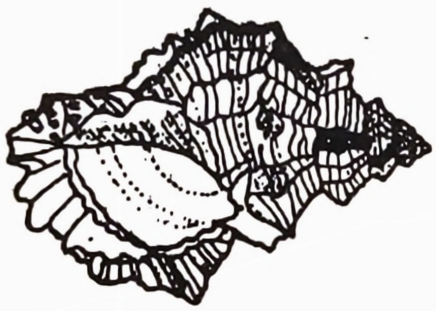
Bursa Margaritula

5. **Bursa Granularis** (Roeding) (Fig.109)

50 mm. The brown and uncleaned shell can easily be mixed up with Gyrineum natator; but the posterior siphonal canal proves it to be a member of the "Frog" family. The shell is also much more elongate and of a light-brown colour throughout with the exception of the whitish bands on the varices. Very rare.

6. **Bursa Rubeta** (Linne) (Fig.110)

75 mm. This middle-brown Frog shell with a long spine and wart-like knobs on the shoulder of the body whorl has a clear distinguishing feature; A reddish-brown aperture. In immature specimens, however, this cannot be found at all or is just beginning as a wide orangy line around the outer and inner lip. Rare.



Bursa Rubeta

THE MUREX SHELLS (MURICIDAE)

"The family of *Murex* snails lives among rocks and coral mostly in shallow water. It has a worldwide distribution and has a large number of genera and many species. The tropical species are numerous and includes many very handsome and peculiar forms, ornamented in many instances with prominent growth ridges (varices) fantastically armed with thickly set spines. The shells are stoutly built, variable in form, sometimes fusiform, but more often with a shortened spire and wide body whorl. In many species the anterior canal is very long and narrow with sides so incurved as to become almost closed and tubular; a posterior canal is absent. The foot is cut off abruptly in front. The proboscis is long and retractile, armed with a long and narrow radula having three teeth in each transverse row; the central tooth has three short spines and several denticles while each lateral one is simple and talon-shaped; with this armature the mollusc is able to bore circular holes in other shells in a manner similar to that employed by Natica and Thais" (Hornell).

The Murex snail has several other ways of dealing with its bivalve prey; small clams may simply be smothered in the folds of the large foot of the snail or the foot may act as a suction pad and the outer lip serves as a lever to force open the two valves. The snail then thrusts it teeth-bearing snout into the soft parts of its victim. Some Murices instead of drilling neat holes in the shells of their prey chip the edges of the valves to make a small opening and suck the animal's juices through it. One observer actually witnessed five large Murex shells attacking a single live clam all at the same time.

The eggs of Murex snails are laid in urn-shaped capsules which the female attaches in clumps to rocks or empty shells. Some species swarm together during the mating season and form a large communal mass of capsules, sometimes the size of a basket-ball. Less agile participants in this mass rally are sometimes buried within the ball of capsules and do not escape until the young hatch and the capsules disintegrate months afterward. (Abbott).

Some of the smaller species, Urosalpinx Species and others together with the purpurid Drupa may cause great damage on the pearl banks in the gulf of Mannar when the pearl oysters are young and thin-shelled.

From several of the Murices the Phoenicians obtained their famous Tyrian purple dye; the animal was extracted whole from larger shells, small ones were broken and crushed in a mortar. Remains of this industry can still be seen on the eastern coast of the Mediterranean (in the Lebanon) in the heaps of broken Murex shells (M. Brandaris) and in cauldron-like holes in the rocks.

1. **Chicoreus Ramosus** (Linne) (Fig.111)

280 mm. "The largest of the Indian Murices is *Chicoreus Ramosus.* This shell is found associated with the rather larger Horned Helmet shells (Cassis cornuta) in deep water (10 fathoms) on the pearl banks of the Gulf of Mannar. By the Tamil fishermen it is called *Ani Sanghu* or Elephant chank. The shell is quite short and massive and wide and the whole surface is beset with powerful spines, slightly curved. The aperture is tinged pink". (Hornell). Some eight or ten large and live specimens were offered by the fishermen on the Pondicherry beach but they too must have come from a considerable depth. Rare.

2. **Chicoreus Aculeatus** (Lamarck) (Fig.112)

52 mm. An elongate medium brown shell with dark-brown foliate spines. The surface has fine dark-brown spiral cords; on the left side of each varix runs a white line almost to the apex. This is an uncommon shell in the sense that only one fishermen produced some 20 specimens over the year. Uncommon.

3. **Chicoreus Rossiteri** (Crosse) (Fig.113)

41 mm. The outstanding feature of this beautiful shell is the pinkishness. The fronds on the varix of the outer lip down to the long siphonal canal are of a reddish pink which gets more delicate on the columella and inside the aperture. Very rare.

4. **Chicoreus Adustus** (Lamarck) (Fig.114)

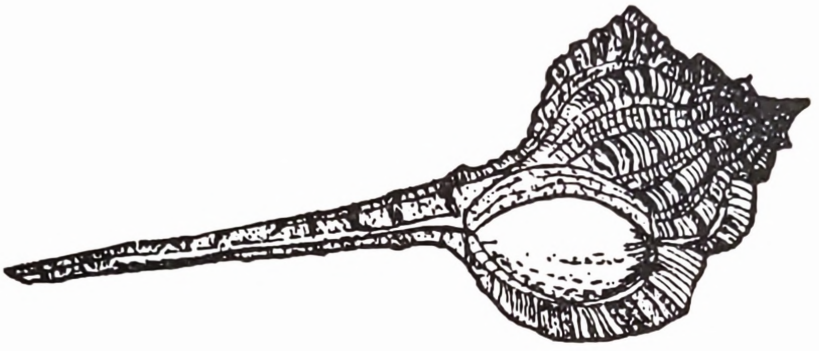
65 mm. This species is easily recognised by its almost entirely black shell apart from a white streaks on the left side of each varix (but this streak is often visible only after thorough cleaning). The black spiral ridges end in the fronds of the varices. Three large tubercles alternate with three varices. The aperture is white with a yellow edge on the inner lip. Rare.

Chicoreus Adustus

5. **Haustellum Haustellum** (Linne) (Fig.115)

70 mm. Unusual for the Murex family, this species has no spines nor fronds; instead it has three vertical folds between the three varices on the body whorl and a spire and knobs on all shoulders. Fine brown spiral lines on a light brown background and three dark bands on the varices make this a pretty shell, enhanced by the dark-pink aperture. The siphonal canal is very long and straight. The whole shell bears a fantastic resemblance to the head of a bird called the woodcock, hence its popular name "the woodcock shell". In America it is named after another bird "the Snipe's bill".

The snail is common on muddy sand on both east and west coasts. It has been noted for occurring in pairs. Common.



Haustellum Haustellum

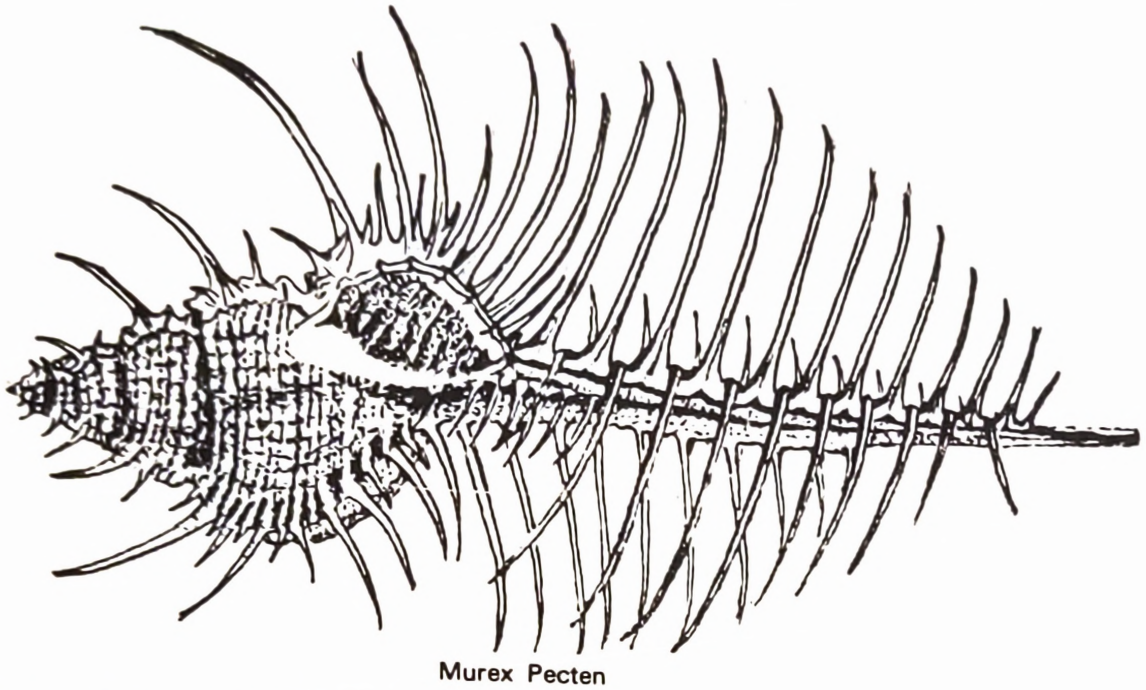
6. **Murex Pecten** (Lightfoot) (Fig.116)

148 mm. Although there are other spiny species to be found on the Pondicherry coast, this one cannot be mistaken for anything else. A count of the set of the long upright spines alone will identify it, for there are about 30 of them; with this magnificent array of protective armour the *Thorny Wood Cock* or *Venus's Comb,* as it is popularly known, has been a favourite with collectors for centuries.

"Spines are produced by many kinds of molluscs, especially among certain families of the Murex or Rock snails. But the champion in the production of long delicate spines is the 15 cm. long Venus Comb Murex from the indo-Pacific. The hard neddle-like spines are produced by extensions of the edge of the fleshy mantle. When the spines have been produced, the extensions are withdrawn from the shelly tubes and resorbed into the mantle. As the Murex shell grows former rows are bitten off by the snail in order to allow the formation of additional body whorls. The spines form a sort of cage around the snail's head which prevent fish from nibbling at the snout and fleshy tentacles" (Abbott). Even so some fishes are not very choosy but, surprisingly seem to be unharmed after swallowing and digesting similar shells.

The Japanese call the Venus's Comb " honegai" (bone shell) because the spines resemble the bones of a fish.

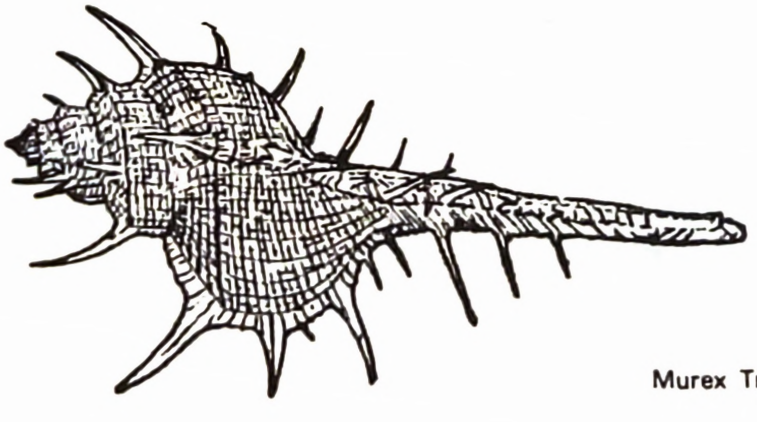
Although this species buries itself half-way into the sand it differs from other molluscs that live on rocky shores in that neither barnacles nor algae cover it.



Murex Pecten

7. **Murex Trapa** (Roeding) (Fig.117)

87 mm. This and the following species are extremely difficult to separate and have been thought by some authors as at best "a variation". Others claim that this species has its distinctive features, such as: the absence of additional rows of spines, the reduced number of spines on the anterior process and the presence of an enlarged tooth on the outer lip below the middle. To this list can be added: the absence of any long spines on the shoulders of the body whorl and different sculpturing on the shell surface; spiral and vertical ridges produce the effect of netting and beading where the two ridges cross. Finally there is the absence of any marking such as the white dash-brown dot—lines on Murex tribulus. Uncommon.



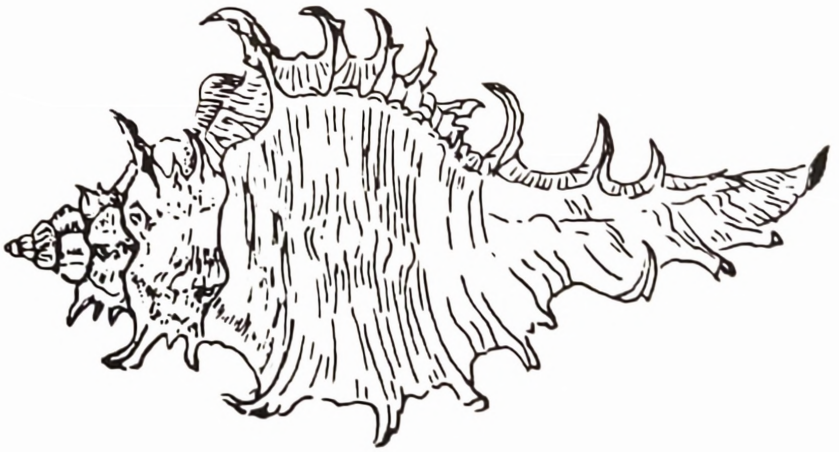
Murex Trapa

8. **Murex Tribulus** (Linne) (Fig.118)

90 mm. The characteristics distinguishing this species from Murex trapa are: (1) three rows of spines (2) more than two spines on the siphon (3) a small tooth on the outer lip (4) two or three very long spines on the shoulder of the body whorl (5) spiral ridges with three or four folds between varices, and (6) white dash-brown dot marking on the major ridges. Very common.

9. **Murex Virgineus** (Roeding) (Fig.119)

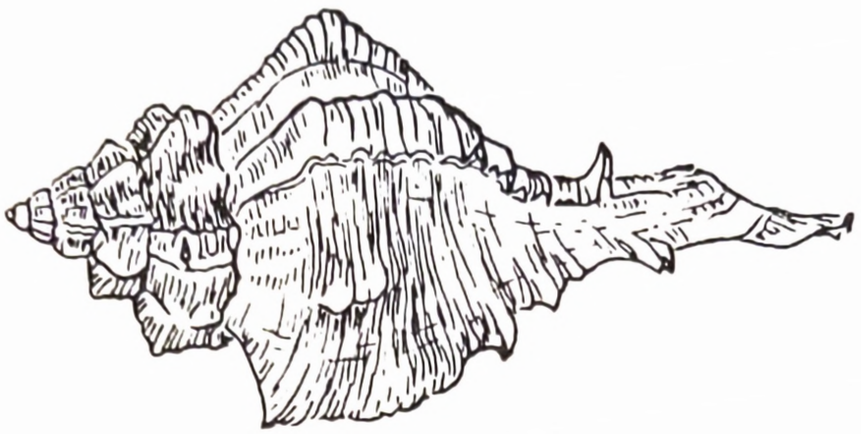
65 mm. The identification of this species has proved extremely tiresome since its variation, Murex virgineus ponderosa, seems to exist not only in its clearly different form but also in further variations as a result of possible cross-breeding: one feature may be present whilst another is missing or showing just a hint of it. In their unmistakable form one characteristic makes it Murex virgineus: if the shell has spiny growths all along its outer lip similar to those on the other two varices—it is it. If a further distinguishing mark is needed, a magnifying glass will reveal finely beaded spiral ridges covering the shell surface. A fresh and clean specimen will have a pink edge on the back varix. Common.



Murex Virgineus

10. **Murex Virgineus** Var. **Ponderosa** (Sowerby) (Fig.120)

65 mm. This like the previous species is identified by looking first at the aperture: if the outer lip is just a thickened varix without any spiny growths and the other two varices are similarly free of them, then it is the variation *Ponderosa*. If further confirmation is needed a line will be found in the coarse spiral ridges and the absence of a pink edge on the back varix. Uncommon.



Muret Virgivieus Ponderosa

11. **Pterynotus Alatus** (Roeding) (Fig.121)

52 mm. The very unusual shape of this completely white shell has made it a "collector's item". The varices are wing-like (hence alatus-winged) and the surface is most delicately textured. Very rare.

12. **Cronia (Ergalatax) Contracta** (Reeve) (Fig.122)

32 mm. All the whorls have angular shoulders along which runs a whitish line emphasizing the knobs of the ribs. Wherever the ridges are coloured they are of a distinct reddish brown, the rest being off-white. Common.

13. **Bedeva Paivae** (Crosse) (Fig.123)

34 mm. All whorls have angular shoulders which also divide the colour scheme into medium brown below the shoulder and a light fawn above. The ribs below the shoulders are angular too. Pointed knobs are produced by the angular ribs. Very rare.

ROCK SNAILS (THAIDIDAE)

The *Rock Snails* also go under the names of *Drupes, Thaids or Purples.* They are only found on the coral rock of the Indo-Pacific area. Most species prefer the edge of the reef where at low tide they are exposed for only a very short time, but some like to settle at the shore end where they are out of the water for many hours.

The Rock shells are rather solid, medium-sized, having wide apertures and no varices. They are difficult to see as their surfaces are covered in heavy lime deposits, algae and other growths which make them appear like part of their rocky background. The undersides, however, are often very colourful in shades of bright purple or yellow; but even the rest of the shell when thoroughly cleaned can be pretty.

"The Tyrian Purples (Thaididae) are littoral shells of small size found on all coasts. The two commonest Indian species Thais bufo and Thais rudolphi are thick-shelled and stoutly built, with a short spire and a fairly wide body whorl and large aperture. They live on rocks between tide marks and along with Turbo on stone-strewn shoals; they are occasionally eaten by the shore people in Tamil districts in South India, while around Bombay Thais carinifera is collected in considerable quantities.

In habits the Purples closely resemble the Murices: they prey on other molluscs, obtaining access to the soft bodies of their victims by the same expedient of boring holes through their shells. They also secrete a fluid which turns into a dull crimson colour (hence "Purples") when exposed to light and which was used by the ancients for dyeing". (Hornell).

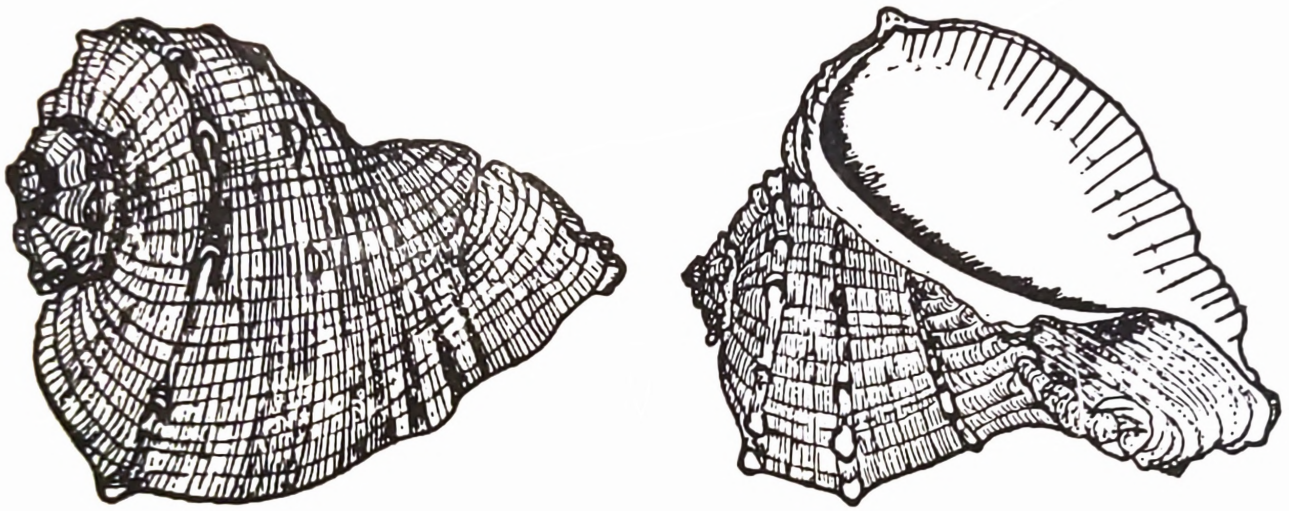
1. **Purpura (Thais) Rudolphi** (Lamarck) (Fig.124)

41 mm. The body whorl is spindle-shaped with flat spiral ridges separated by narrow grooves. A few ridges at more or less regular intervals are stronger developed and have irregular white dashes and some dots. The colour of the shell varies from middle brown to almost black. Rare.

Thais Rudolphi

2. **Rapana Bulbosa** (Solander) (Fig.125)

82 mm. This shell has a very low spire but an immensely inflated body whorl with close set spiral ridges and grooves. There are two rows of knobs, one on the shoulders and one half-way down the body whorl. This middle row, however is likely to disappear on larger specimens but is clear on young shells. The umbilicus has a wide opening with a frilly outer edge. The shell is a light brown but younger and clean shells may be almost olive green with brown vertical streaks. A brown edge inside the outer lip also tends to disappear in large specimens. Very common.



Rapana Bulbosa

3. **Thais Bufo** (Lamarck) (Fig.126)

80 mm. This species can be mistaken for Purpura rudolphi, particularly small and immature specimens. The similarity lies in the surface sculpturing and pattern of white dashes. But the differences are really quite distinct: The shell is much broader and even in young specimen much more solid. Large shells are very heavy indeed. The spine is very short and there are knobs on the shoulder of the body whorl (absent in Purpura rudolphi). The trouble is that large specimens are so covered in a thick crust of lime that neither the shell texture nor the pattern nor knobs can be verified, but their weight and broad shape distinguish them; cleaned shells are of a light brown colour with two rows of darker brown knobs on the body whorl. Common.

Thais Bufo

4. **Thais Mutabilis** (Link) (Fig.127)

57 mm. In large specimen the body whorl and the conical spire form two distinct parts of the shell whilst in younger specimens this separation has not taken place. There are two rows of spiny knobs on the body whorl, the lower row ending in a notch on the outer lip. The outside colour of the shell is greyish with a tinge of brown. Very rare.

5. **Thais Rugosa** (Born) (Fig.128)

40 mm. This and the following species are another confusing pair and so much alike that they need careful examination. The features of Thais Rugosa are a rhombus shaped profile, a strongly elevated spine with a sharply pointed apex and whorls with angular shoulders. There are four ridges on the body whorl with sharp spiny knobs which are very strong on the top ridge and smallest on the lowest ridge. The ridges form small grooves inside the outer lip. The shell is a pale brown with dark brown markings on the knobs; the aperture is white. Uncommon.

Thais Rugosa

6. **Thais Tissoti** (Petit) (Fig.129)

46 mm. The main differences between this species and T. rugosa are clearly visible when the two shells lie side by side. Thais tissoti is much more elongate and all the knobs are blunted. Very rare.

Thais Tissoti

7. **Mancinella Alouina** (Roeding) (Fig.130)

46 mm. A heavy, globose shell with five rows of the solid spikes and a hint of a sixth row on the shoulder of the body whorl. A yellowish callus covers the whole of the columella; there are faint orangy lines inside the shell. Both our specimens are rather "dead" and the shell opening may be more colourful in "live" specimens. Very rare.

CORAL SHELLS (MAGILIDAE)

Opinions on the habitat of the genus *Latiaxis* seem to vary. One author writes that "like all members of the Coralliophilidae (Magilidae) family Latiaxis lives on the corals in the infralittoral and circalittoral Zones". (Schuster) Peter Dance, on the other hand, says: "Latiaxis shells are most commonly found in deep water around Japan".

"Of all the deep sea snails, the Latiaxis shells exhibit the most graceful and most intricate spines. Their forms are so variable that the number of species existing in the world's oceans is not exactly known. Japanese seas harbour several dozen species" (Abbott). It is interesting that none of the Latiaxis species has radular teeth which suggest that the snails feed by sucking juices from the other sea creatures.

Latiaxis Sp. (Fig.131)

58 mm. This is a light-fawn coloured shell with a long spine and distinctly separated whorls: around the middle of each whorl runs a row of long, widely separated spines with the exception of the body whorl: this has two more rows of much smaller spines on the lower half having the appearance of a saw-blade; there is a longish siphonal canal and a small umbilical opening.

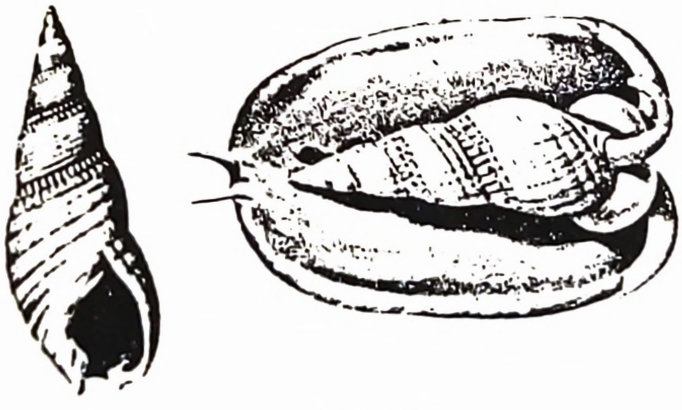
These shells are very difficult to clean, but once the various accretions have been removed a pinkish-white shell emerges with a pretty pinky spine. Very rare.

DOG WHELKS (NASSARIIDAE)

"The family of the *Dog Whelks* are all small and often tiny shells of the outline of the chank in miniature, usually covered with many rows of tiny tubercles; the mouth aperture is constricted with the outer lip thickened and often armed with prominent "teeth" as may also be the inner lip formed by the growth of a strong callus deposited upon the end of the columella. The foot is long and broad and sometimes bifurcated behind. The siphon is long and conspicuous. The Dog Whelks are in the main scavengers living on carrion; their sense of smell is extremely acute and they may be trapped in numbers by laying down a dead crab or a piece of decaying meat in shallows or in a rock pool. If Dog Whelks abound it will not be long before they are seen trooping from all sides each with its siphon extended in front, waving enquiring from side to side, trying to locate the source of the odour they smell. They cluster round and over a dead mollusc or a dead crab exactly as ants do over a dead insect that they have found, but instead of dragging it away to their nest as ants would do, the Dog Whelks devour their find there and then. They are great enemies of small bivalve molluscs, seeking them out by burrowing through sand". (Hornell).

1. **Bullia Vittata** (Linne) (Fig.132)

48•mm. This is a shell with a tower-like spire. The body whorl is of a light grey colour whilst the spire is medium grey. At the top of each whorl are two white ridges made up of rectangular areas. The surface of the whorl is covered in many fine vertical and a few spiral grooves.



Bullia Vittata

"Bullia Vittata never was and never shall be considered a rarity, since it is a very common species in the Indian Ocean. It also has no pretension to beauty. This species is particularly abundant in the littoral zone of the Madras coast where it feeds voraciously on little crabs. It envelops a crab in its muscular mantle folds and clings so tightly to its victim that it will allow you to pull it almost out of its shell before letting go. It absorbs through pores in its large foot a great deal of water until it becomes bloated. By compressing its foot water is squirted out in various directions to the endless amusement of many children of Madras. At low tide on a level beach the receding waves uncover large numbers of Bullia vittata engaged in obtaining food by burrowing below the sand surface. In order to regain their feeding positions they wave their water charged foot in the air and then twist it over to secure a firm grip on the sand. The shell is then pulled over with a jerk into its original position. As soon as this position has been achieved the mollusc is ready to burrow beneath the surface of the sand again". (Dance) Common.

2. **Bullia Belangeri** (Kiener) (Fig.133)

36 mm. The general shape of this very light brown shell resembles Bullia vittata. Fresh specimens have pretty brown vertical lines the whole length of the shell. Uncommon.

3. **Nassarius Olivaceus** (Bruguiere) (Fig.134)

42 mm. A short dumpy shell with a smooth surface except for the last four or five top whorls on the spire which have vertical ridges. Its colour is variable from greyish to reddish brown or pinkish brown: in immature shells there is a faint trace of a spiral band on each whorl. Uncommon.

4. **Nassarius (Zeuxis) Comptus** (A. Adams) (Fig.135)

26 mm. A shiny shell with light brown streaks all over. At the top edge of each whorl are white and brown blotches; the body whorl has a slightly darker spiral band, both inner and outer lip are slightly grooved. Uncommon.

5. **Nassarius Variegatus** (A. Adams) (Fig.136)

24 mm. The whole white shell has a regular pattern of beaded spiral and vertical ridges. There is a hint of two very light brown bands below the shoulder and the middle of the body whorl. Common.

6. **Nassarius Pullus** (Linne) (Fig.137)

18 mm. The two outstanding features of this white shell are the vertical oblique ridges and a large callus both extending from the top of the body whorl to the siphonal canal. Very rare.

Nassarius Pullus

7. **Nassarius Stolatus** (Gmelin) (Fig.138)

15 mm. The peculiarity of this shell are four white vertical ribs counted from the columella fading into white knobs on the shoulder of the body whorl. The spire is completely ribbed. The colouration of the shell is a light fawn with two brown bands on the body whorl and brown spaces between the ribs of the spire. Very rare.

8. **Nassarius Novaezelandiae** (Reeve) (Fig.139)

16 mm. The white shell is closely ribbed throughout and crossed by fine spiral grooves. Very rare.

9. **Nassa Hepatica** (Montaqu) (Fig.140)

30 mm. A yellowish shell resembling the previous species having vertical ribs but without spiral grooves, shoulders are almost beaded. We have only one poor specimen.

Nassa Hepatica

WHELKS (BUCCINIDAE)

Whelks are found worldwide. The members of the family *Buccinidae* form a large group of many genera with over 400 species. Some of these are so abundant in places that they may be collected by the millions (and of certain edible species millions are collected annually). This is one of the few families to have representatives both in arctic and tropical waters. Arctic species of the genus *Buccinum* are generally drably coloured, but the tropical genera are colourful and live in shallow water on sandy or muddy bottoms.

Nearly all whelks are carnivorous. They have a radula ("file tongue") with three rows of strong teeth which is most effective in drilling holes in the shells of clams; their diet also includes marine worms, dead fish and similar offal.

Out of the hundreds of different species of whelks Pondicherry can only claim a few but these in large numbers indeed.

1. **Cantharus Tranquebaricus** (Gmelin) (Fig.141)

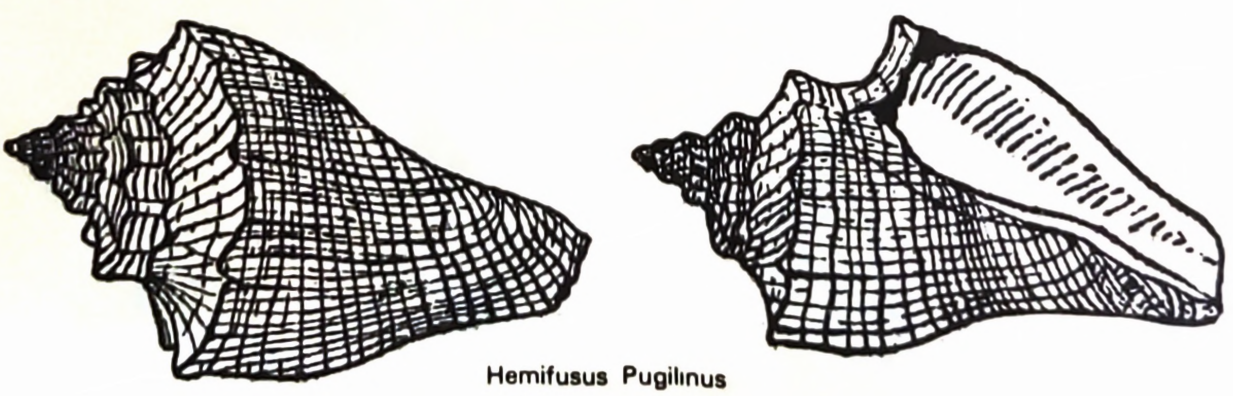
45 mm. The species has a fairly thick shell with nine or ten vertical ridges (like varices) forming flattish knobs on the shoulder of the body whorl. The whole surface is covered in fine spiral ridges separated by wide, shallow grooves. The outer lip is teethed like the blade of a saw. A thick brown periostracum usually completely hides the yellowish-brown colour of the shell. Very common.

2. **Cantharus Spiralis** (Gray) (Fig.142)

23 mm. The white ridges are widely separated by broad flat brownish grooves. Only the spire is ribbed with brown spaces between the white ribs. Very rare.

3. **Hemifusus Pugilinus** (Born) (Fig.143)

115 mm. The uniformly light brown shell has a swollen body whorl with strong, flattish knobs. The interior is of a pinkish-brown colour. Very common.



Hemifusus Pugilinus

4. **Babylonia Spirata** (Linne) (Fig.144)

60 mm. "The only conspicuous Indian genus of the whelks or Buccinidae is Babylonia. Its species are stout, whelk-like shells, solid and smooth, the white shell usually spotted and colourful with brown (sometimes red); the pattern is obscured during life by a thick dirty-brownish periostracum. A very characteristic feature is the rectangular form of the suture dividing the whorls. In the young an umbilicus is present; with age the inner lip becomes thickened and eventually spreads over the umbilical opening" (Hornell).

Few snails are as heavy for this size as the Babylon shells. Perhaps this is why the animals inhabiting them are usually so slow in their movements although they are quick to sense danger and rapidly retreat into their shells when alarmed.

With its preference for bivalves, Babylonia spirata is a pest on oyster beds.

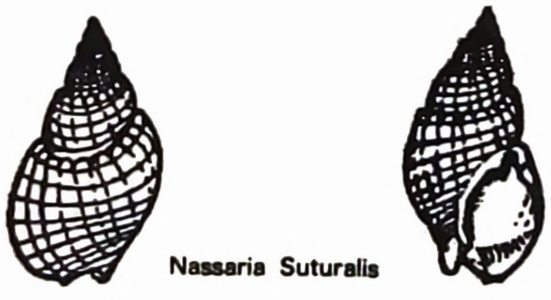
Babylonia Spirata

5. **Babylonia Zeylanica** (Bruguiere) (Fig.145)

65 mm. This is a fusiform shell with a well developed spire ending in a dark purple apex. It has a smooth surface with a pattern of alternating rows of large brown blotches and bands of large roundish spots. One of its distinctive marks is the long open umbilicus with a row of teeth on a purple streak. Very common.

6. **Nassaria Suturalis** (A. Adams) (Fig.146)

24 mm. The white shell is ribbed throughout with widely spaced spiral ridges on all whorls. The special feature is an unusually high varix on the outer lip and an almost circular aperture. Very rare.



Nassaria Suturalis

7. **Nassaria Nivea** (Gmelin) (Fig.147)

31 mm. The whole white shell is lightly ribbed with widely spaced spiral ridges on all whorls. Notable in this species are the two varices on each whorl. The outer lip is strongly toothed giving it the appearance of a saw blade. Uncommon.

8. **Pollia Melanostoma** (Sowerby) (Fig.148)

58 mm. If the shell is heavily encrusted it may at first glance be taken for clathrus tranquebaricus. However, a look at the umbilicus will settle the identification, for it is dark brown and covers the whole length of the inner lip. The clean shell is heavily ridged and of an unmistakable golden-brown colour. Rare.

TULIP SHELLS (FASCIOLARIIDAE)

THE *Tulip Shells* or *Knobbed Chanks* are found worldwide. They often grow to a great size like the 20" (50 mm.) Horse Conch of Florida. These snails, like the whelks, are carnivorous and feed on clams.

1. **Fasciolaria Trapezium** (Linne) (Fig. 149)

230 mm. "In India the largest common species of the knobbed chanks is Fasciolaria trapezium, a chank-like shell with as short spire, armed with stout knobs. A thick, brown periostracum protects the shell. It lives on the same ground as the chank but in comparison is much scarcer. The eggs are in numerous vase-shaped capsules" (Hornell).

Most specimens of this species are not only covered by the mentioned extremely tough periostracum, or skin, but heavily encrusted in lime thus making it into a rather ugly shell—apart from the splendid purple inner lip of live snails. Persistent and careful cleaning, however, reveals an unsuspected beauty of a white shell with pairs of brown spiral lines, large patches of orangy-brown and a completely orangy-brown spire—an ugly duckling turned into a beautiful swan. Uncommon.

Fasciolaria Trapezium

2. **Latirus Nassoides** (Reeve) (Fig. 150)

38 mm. The specific marks of this shell are a white band on a light brown background on each whorl and a pink aperture. The spaces between the ribs are of a slightly darker shade of brown. Rare.

3. **Fusinus Longicaudus** (Lamarck) (Fig. 151)

150 mm. There are over 50 species of *Spindle Shells* which live in the tropical waters of the world. Their shape is quite distinctive with a long spire and a long, generally straight, siphonal canal and spiral ribbing.

The spindle shells live on soft, sandy bottoms where they feed on bivalves and sea worms. The long siphonal canal serves as a snorkel to obtain water when the animal is buried in the sand. The shells do not usually occur in great numbers but rather are found singly or in pairs, as seems to be the case with carnivores that feed on sparsely distributed clams and worms.

Fusinus Longicaudus—The long tailed spindle is the only snail of this group to be found at Pondicherry but very common. It can be had in all sizes from very small immatures to giant length. The shell is wholly white and not to be confused with Fusinus nicobaricus which has vertical streaks. Very common.

OLIVES (OLIVIDAE)

There are over 300 kinds of *Olives* inhabiting the warm seas of the world. They are variable in size though not in shape, generally cylindrical with a short spire and a siphonal notch. The columella has folds—the sign of the Olive family. The shells are very hard and shiny, the polish being made by the mantle and the foot of the animal covering the shell. There is great variation in colour and in markings.

The Olives move 1-2 cm. under the sand using their large foot like a shovel. They have, however, a very long, fleshy siphonal tube which protrudes above the level of the sandy bottom. The tube is used for taking in water, but most likely also serves as a smelling organ. Any scent of food such as dead fish, shrimps, or a live clam will bring an olive to the surface.

The food is covered with slime and then passed to the rear of the foot which forms a pouch for hoarding the future meal. Olives seem to be indifferent to the condition of their meat consuming it living or dead, often seizing it with their foot and dragging it underneath the sand to eat undisturbed. Live prey is enfolded in the large foot and then suffocated.

Living under the sand and hunting by night, the olives' eyes are poorly developed; they are situated about halfway along the tentacles.

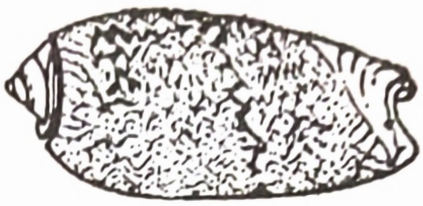
"After mating, the female olive lays minute, clear egg capsules about 1/10" (2.5 mm) in diameter. Each capsule contains ca. two dozen eggs which hatch in about a week into small, free-swimming larvae". (Abbott).

Hornell writes (1948) that "On the Coramandel coast Olives are extensively used as food by the Pattanavar or sea-fisherman caste. The chief collecting season is during spring tides during the fine weather period from February to April. Towards the end of the ebb of the Pattanavar Women and lads search for them in shallow water by turning the sand over with their feet or in the case of those in uncovered sand by marking the trails as the Olives travel about. The women boil their catch in fresh water, extract the flesh, and then either use it in their curry or fry it in oil.

One author expresses his surprise that "for no obvious reasons Olives are not as popular with collectors as cowries". The reason becomes obvious to anyone who tries to identify only the olives of the Pondicherry coast. There are so many extraordinary colour and pattern variations in many species that it is almost impossible to identify with certainty large numbers of shells, and the amateur without a contact with a helpful specialist has to give up in despair and just lump them in a box as "unidentified olives"—a most unsatisfactory state of affairs.

1. **Oliva Oliva** (Linne) (Fig 152)

40 mm. No other Olive appears to have a projecting callosity at the top end of the columella making almost a slit; it may therefore be taken as *the* mark of identification apart from the fairly regular colouration; Vertical brown wavy markings and two dark brown spiral bands on a yellowish background; the inside of the aperture is grey. Common.



Oliva Oliva

2. **Oliva Ispidula** (Linne) (Fig.153)

38 mm. This is one of the species whose colouration is very variable; white, yellow, brown, or almost black with dark mottling or zig-zag patterns or spiral bands on the body whorl; sometimes the colour is even uniform. One might almost say if a shell does not clearly belong to one or the other live olive species it is an *Ispidula*. Common.

3. **Oliva Textilina** (Lamarck) (Fig.154)

95 mm. This is the largest and most beautiful of the local Olives. The shell is elongate with a short conical spire; the outer lip is thick; the creamy-brown callus extends over the folds along which are intercrossing brown lines; two brown spiral bands run across a cream to gold coloured background. Seasonally common.

4. **Olivancillaria (Oliva) Gibbosa** (Born) (Fig.155)

70 mm. The shell is stout and heavy with a short spire, the body whorl is inflated, at times greatly so, a thick callus on the columella spreads over the whorls of the spire; the body whorl is covered with dense brown reticulation on a white backgound; there is a row of brown markings along the lower margin of the body whorl and a similar but narrower band below that. Common.

Olivancillaria Gibbosa

5. **Olivancillaria Steeria** (Reeve) Syn. **Oliva Nebulosa** (Lamarck) (Fig.156)

39 mm. The two names of this shell appear to have been given to the same species. It resembles the preceding one in pattern and colouration so closely that it is not easy to keep the two apart. However, the shell is markedly more slender and elongated with a much less inflated body whorl and a comparatively narrow and elevated spire. The background colour seems to be yellowish whilst on O. Gibbosa it tends to be greyish. It also seems that this species does not grow to the length of O. Gibbosa. Common.

6. **Oliva Vidua** (Roeding) (Fig.157)

21 mm. The unusual feature in this shell is the almost flat top with a minute but sharp spire. The pattern too is distinct; Columns of brown zig-zag pattern with two darker brown zig-zag bands.

7. **Ancilla Ampla** (Gmelin) (Fig.158)

32 mm. The small, slender and elongate shell has a well elevated spire which tapers to a sharp pointed apex. The surface colour is from white to creamy-brown with orange-brown or rusty-brown around the spire and apex. Common.

Ancilla Ampla

VASE SHELLS (VASIDAE)

The *Vase Shells*—also called *Dog Chanks* are a small family of some 25 species which are abundant in tropical seas. They are usually solid and heavy shells with a plaited columella, living on reefs in shallow water and on sandy bottoms. Vase shells are believed to feed on clams and marine worms. If they are rarely seen in collections it is, no doubt, for the simple reason that they are not very pretty (to be polite to the shells). Even the beautiful yellow and purple outer and inner lips of some species tend to fade very quickly once they are out of the water.

The only representative of this family at Pondicherry is Tudicla spirillus; it is an unusual species as it does not have any of the characteristics of the volutes.

Tudicla Spirillus (Linne) (Fig.159)

71 mm. This is a very striking unmistakable shell with a terminal knob like a protoconch. The shoulders of the whorl have a sharp ridge marked with brown dashes; the body whorl is bulbous with a long siphonal canal; the surface is finely ridged and grooved. The general colour of the shell is a brownish-grey with irregular brown blotches particularly above the shoulder ridge of the body whorl. The coloumella stands as a white, thin, straight or rounded flap ending in what might be the beginning of a fold. This flap is absent in immature specimens and seems to be the last part of the shell to be completed. Common.

CHANKS (TURBINELLIDAE)

Members of this family are better known by their synonym *Xancidae*, as the generic name *Xancus*—hence chank—is better known than that of Turbinella.

In the order of families the *Chanks* follow the *Vase* shells; since some authorities consider the two so closely related as to be only subdivisions, reference books have little to add to the general information on chanks. Instead, all enlarge on *the* chank among chanks, and *the* shell among shells, "The sacred chank of India" — *Turbinella* (Xancus) *Pyrum*.

The chank's economic importance is demonstrated by the flourishing chank fishing industry in South India and the bangle cottage industry in rural Bengal. The shell's religious significance is known to every Hindu household for no puja room or smaller shrine is complete without a chank, and no joyful occasion has been properly celebrated until the sound of this conch has been heard.

Turbinella Pyrum

James Hornell, one-time Director of the Madras Fisheries Department and much venerated explorer of Indian marine life, has written a most thorough and valuable study of the subject which has yet to be excelled. In view of the difficulty of obtaining any of his publications and in consideration of the interest and importance this shell has in India, it seems right to quote fully Hornell's description in his book "Indian Molluscs" which cannot be bettered:

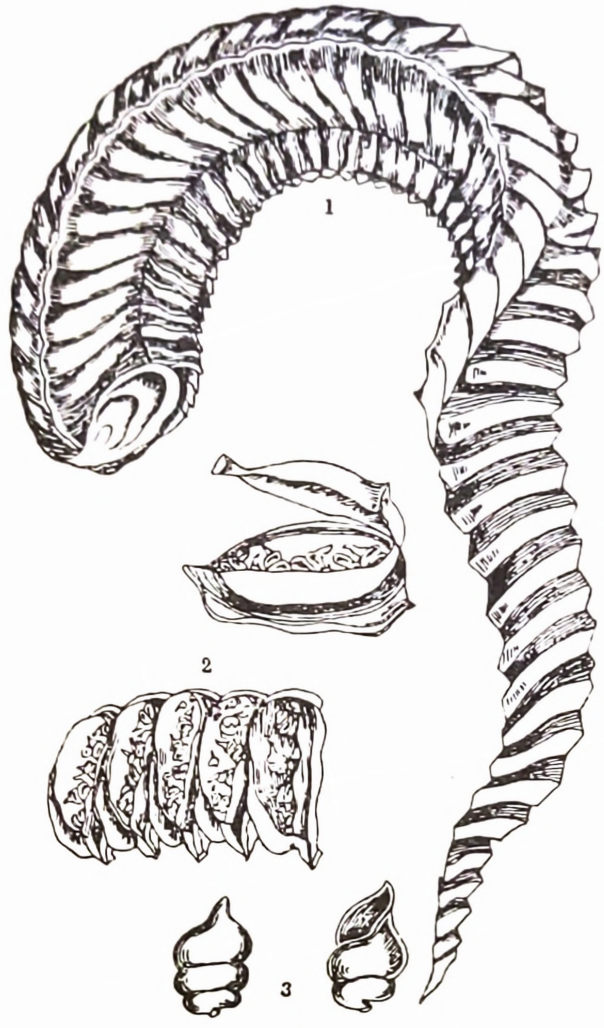
"The *Xancus (Turbinella) Pyrum* is a species strictly confined to Indian waters, occurring nowhere else in Asia. There are several local varieties or sub-species; these appear to have originated when numbers of the parent type became separated from the main body of the species and exposed to changed environment conditions.

The central or type form, found only in the Gulf of Mannar and on the Kathiawar coast, is distinctly fusiform or spindle-shaped, with a handsome, well-balanced spire. The mouth is wide and is prolonged anteriorly into a long, deep canal lodging the great siphon used in sensing the presence of the worms on which it feeds. The columella bears three or sometimes four strong ridges to which the very strong columellar contractor muscles are attached. Individuals living in shallow water, where they are exposed to the influence of strong currents during the South-west monsoon, have these ridges particularly strong and prominent in order to afford increased purchase to the muscles connecting the foot with the shell. The exterior is covered with a thick velvety coating of golden-brown periostracum, completely hiding the snowy white procellaneous shell beneath.

The chank is gregarious and its haunts form distinct beds. It prefers a sandy bottom where tube worms abound; these constitute its chief food. The most prolific beds occur in depths of 8 to 10 fathoms in the Gulf of Mannar; in Palk Bay to the north of Adam's Bridge the local race or variety rapa (X. pyrum *var,* rapa) occurs in beds at a lesser depth in sand much mixed with mud; this environment has resulted in the formation of a race showing signs of retarded growth, the most obvious being a reduction in the height of the spire. In the Andamans a race is found so distinctive in its characters that it is desirable to consider it as a separate species (Xancus fusus). The anterior canal is much elongated and distinct remains of knobs are present along the shoulders of the whorls, an ancestral feature all but obliterated in chanks of the mainland waters.

The larval development of the chank is typical of that of many of the gastropods of this group, and is almost identical with that of the European Whelk (buccinum). The ova are deposited in a many-chambered stiff parchment-like egg-capsule of striking appearance. The general form is an elongated, loosely spiral annulated cylinder, each annulation representing one capsule unit; the whole looks like a miniature ram's horn, corrugated and twisted, set point downward in the sand. When newly formed it is pale opaque yellow in colour; with age it darkens and becomes covered with low growths of algae. It stands upright on the sea bottom, the lower and first formed end rooted in the sand by means of a broad, flange-shaped anchoring disc. The lower end is narrow and neck-like, the chambers small; these gradually increase in size as they ascend till at a point about one half of the length from the base they attain maximum size which is thence maintained to the abruptly truncate summit. The total height is from 7 to 10 inches.

This case is a compound capsule consisting of a number, 25 to 30 or even more, of discoidal capsules attached at one point to the edge of a broad basement band that runs along one side of the case from base to summit. Without this



EGG CAPSULE OF CHANK

"The spawn of the Turbinella consists of a series of sacs or oviferous receptacles (pl. iii, fig. 1), the transverse markings in the figure indicating the dimensions of each capsule. In the fresh state the membranous walls of the sacs are pliable, although tough and horny ; and it will be observed that, during the drying process, the spawn has, from the irregular shrinking of the two sides, become curved and twisted so as to have somewhat the appearance of a horn . . . . . In fig. 2 a side view is given of a separated capsule, and fig. 3 gives magnified sketches of the young shells. The larger oviferous sacs of the Turbinella spawn contain from 8 to 10 young shells each, but the smaller ones, towards the end of the specimen, are barren. In fig. 1 there are 30 fertile sacs, and, say that each of these on an average contains 6 germs, we thus have altogether 180 young shells in the whole of the cells".

The largest number of young shells which I found in a single specimen was 235, of which the average diameter was .62 inch.

Madras Journal of Literature and Science, vol. XXIV, 1879, pp 232-234.

knowledge it would be difficult to understand the complicated structure. The various capsules are closely set, the roof of one practically touching the floor of the one above. In the floor of each capsule is a crescentic slit parallel with the front edge, hence when the case sways to the current, the partition walls of the individual capsules gape slightly and so allow a circulation of sea-water to provide the aeration needed by the larva. The horizontal partitions are much thinner than the outer wall.

In each chamber or capsule a considerable number of fertilized ova are deposited, embedded in a transparent, colourless, albuminous nutritive jelly, completely filling the interior. In this matrix the embryos go quickly through the trochosphere stage and then assume a modified veliger form characterized by the possession of a spiral larval shell. This is quite different from that of the adult and is distinguished by the term protoconch. When fully developed it reaches a length of about a quarter of an inch, the whorls are all nearly the same diameter, so that it appears as a cylindrical coil of about 2½ to 3 turns. During the earlier larval period fratricidal war occurs among the brood ending in the disappearance of the weaker among them, till only some half dozen remain alive to complete their development within each chamber. The change to the immature semblance of the adult form takes place suddenly; there is no gradation from the cylindrical form of the protoconch into that of the young adult form marked by the expansion of the mouth whorl, an expansion that widens continuously to keep pace with the rapid increase in size of the young chank. Differences of the colour and surface also take place; from the white, smooth surface of the protoconch, the newer part of the shell becomes brown-flecked, with a distinctly angular shoulder bearing the low knobs.

By the time the young chanks attain a length of rather over half an inch, all the nutritive contents of the capsules have been exhausted; this and the fact that they are no longer able to devour one another because of the increased stoutness of their shell combine to compel the ravenous young to leave home in search of food. Their first step is to eat through the partitions dividing the separate chambers, a proceeding which results in the bringing together of the whole surviving family, numbering usually from 200 to 250 in all. The stronger next either eat a way through the outer wall or force their way out between the capsules. The whole brood follow to scatter over the adjacent sea bottom to lead independent lives. It is noteworthy that in the chank the protoconch persists through life, accidents excepted, at the apex of the shell.

The breeding season when the capsules are fashioned and rooted in the sand, extends throughout January, February and the first half of March. The sexes are separate. The chank is an excellent instance of the acquisition through natural selection of characters which appear, for all practical purposes, absolutely perfect to enable it to hold its own with ease in its struggle of existence. The massive strength of its shell protects it from the attacks of all ordinary fishes; the

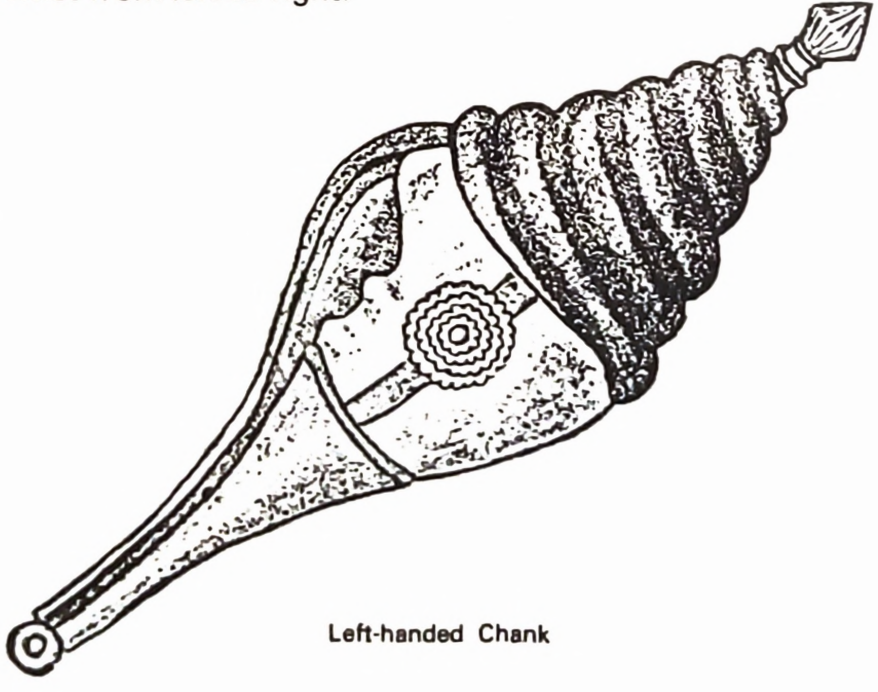
density and thickness of its periostracum give, during youth and maturity, adequate protection against the insidious attacks of the boring sponge Cliona and its shell-tunnelling congeners, the strong capsule which it constructs for its young gives them protection till they reach a self-supporting stage, endowed even at this early period with a fairly strong and resistant shell. Its semi-burrowing habit gives it defence against those fishes which are accustomed to snap off the protruded feet of gastropods.

As chanks grow old their resisting powers diminish and the protecting periostracum receives damage, thereby permitting the burrowing Cliona to obtain a lodgement in the shell substance. Once there it speedily runs its branching tunnels everywhere, converting the solid shell into a honeycombed mass.

The chank fisheries of India and Ceylon produce on an average over 20,00,000 shells per annum. In some years the number may rise to about three millions but of these the greater number are 'dead' or sub-fossil shells dug out of the mud of the Jaffna lagoons in Ceylon where they have lain for hundreds of years, covered in an ever increasing deposit of silt.

The bulk of the shells fished are exported to Bengal where they are sawn and carved into bangles used universally in that province by the Hindu women of all castes. In the Tamil Nadu districts of Madras great numbers of small ones are used as amulets to protect against the evil eye, especially in respect of draught bullocks and cows in milk.

Among the chanks fished each year are usually a few sinistral or left-handed examples in which the whorls of the shell instead of twisting clockwise from left to right when the shell is held with its mouth or anterior end pointing forwards,are reversed and twist from left to right.



Left-handed Chank

On account of their rarity these abnormal shells are accounted by Hindus and Buddhists of great religious value. A sinistral chank is one of the emblems of Vishnu and such shells are amongst the most important of the treasures of the great Hindu temples. In Tibet the Lamaistic monasteries treasure similar objects, gorgeously mounted in silver, richly embossed. At one time the value of sinistral chanks is said to have been assessed at their weight in gold. Good shells are still assessed by weight, the price per tola increasing greatly as the shell becomes heavier.

The Conch of Vishnu

The holiness of the "Sacred Chank" (Sanskr. Samkha) can be traced into dimmest antiquity. There are several legends which try to explain the origin of the special place, this shell takes in Indian ritual and folklore. The following story in the Bhagavata Purana (x.45) may serve as an example.

Krishna and Balaram were about to leave their guru Sandipani and persuaded him to ask for his preceptor's fee (Gurudakshina). Sandipani, after consultation with his wife, requested the restoration of his son who had drowned whilst bathing in the sea. The two illustrious disciples agreed saying, "So be it", and mounting their chariot, the two brothers presently reached Prabhasa and going near the seashore, squatted there for a moment."

"Coming to know of their divine character, the God presiding over the ocean brought presents for them. The Lord said to him: "Let my preceptor's son be restored at once, the same child who was swallowed up by you in a great wave here.".

The God of the ocean replied: "I did not carry away the child, Lord. There is a great demon belonging to the Daitya class, Panchajanya, who lives under the water in the form of a conch, O Krishna! The child was surely carried away by him.".

"Hearing this the Lord speedily plunged into the water but on killing the demon did not find the child in his bowels. Taking the conch that formed the Daitya's body the Lord returned to his chariot. Then going to the beloved city of Yama, Sanyaman, Sri Krishna accompanied by Balaram, who had a plough for his weapon, blew the same conch. Hearing the blast of the conch Yama, the chastiser of the people, offered to them worship on a grand scale, accompanied with devotion, and bending low, addressed Sri Krishna; "O Vishnu, disguised as a human being by way of sport, what can we do for you both?".

The glorious Lord said: "O great ruler, fetch my preceptor's son who was brought here as a result of his own karma! Handing over to their preceptor his son, brought by Yama with the words 'So be it', the two brothers forthwith returned to their city....".

It will have been noted that Sri Krishna was addressed by Yama as "Vishnu, disguised as a human being," which must mean, in fact, Krishna's and Vishnu's chank are identical, namely the conch called *"Panchajanya"*. And this takes us directly to the battlefield of Kurukshetra where at the beginning of the battle the leaders on both sides blow their conches to encourage their followers and dishearten their opponents. "Then Sri Krishna and Arjuna seated in a great chariot with white horses yoked to it, blew their celestial conch shell horns. Sri Krishna blew his conch Panchajanya, Arjuna blew Devadatta, and Bhima of terrible deeds sounded his great conch Paundra—"that tumultuous uproar pierced the hearts of the followers of Dritarashtra....."

Vishnu holding chakra and chank

HARP SHELLS (HARPIDAE)

The *Harp Shells* get their name from the musical instrument with many strings—the harp. They are most beautiful shells both in colour and in pattern and are among the favourites of shell collectors.

The "Harps" are a small family of 12 or 14 species with a greater or lesser number of vertical folds or ribs. The ribs are formed during the shell's seasonal growth. Every time when it is about to stop growing it makes a thick lip most probably to strengthen the edge of the shell. By the number of ribs, therefore, one can tell how many times a shell has stopped growing.

The "Harps" have a large foot with a tiny operculum near the end of it; it is so small that it is difficult to think what purpose it could serve.

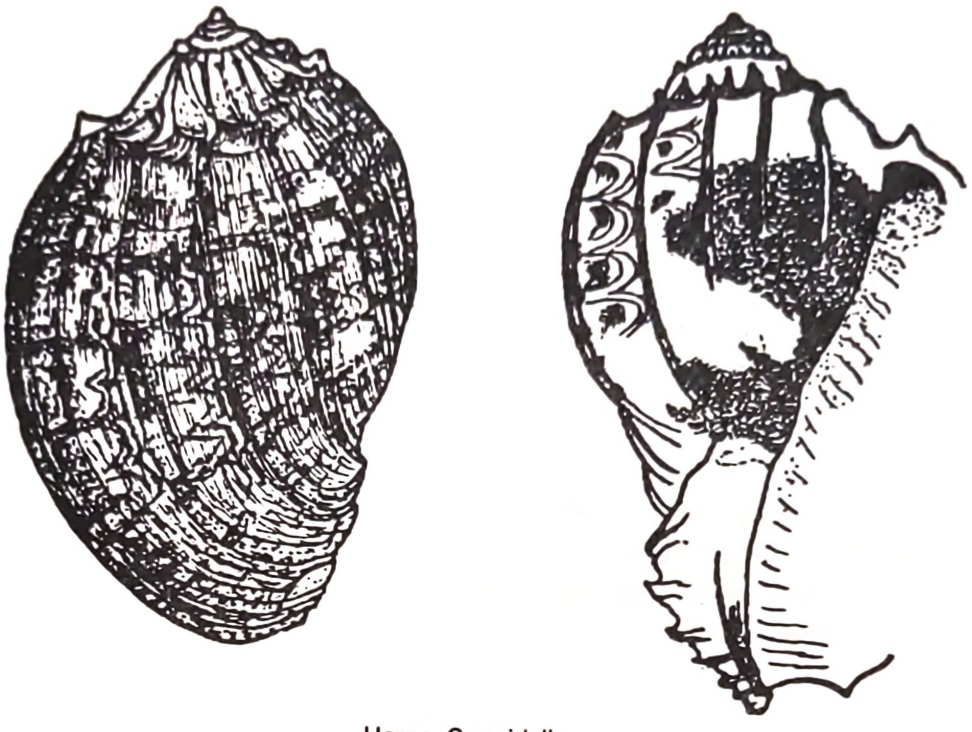
The "Harps" live in the sandy part of the reef among rocks and coral. They are very active and fast movers in search of food. Being carnivorous, they hunt for box crabs. When caught, the prey is enveloped by the large foot and smothered in sticky mucus and grains of sand.

Like the lizard giving up the end of its tail, the Harp snail tries to avoid being captured by cutting of the end of its foot with the sharp edge of its shell. Hopefully, the pursuer will fall upon this titbit, meanwhile enabling the snail to escape. The lost part will grow again within a few weeks; it has been observed, however, that the same self-mutilation takes place when the animal is irritated or frustrated.

The "Harps" preserve their beauty by being able to fold their mantle lobes covering the whole shell: they protect it from damage and at the same time do any necessary repair work and maintain the beautiful polish.

1. **Harpa Conoidalis** (Lamarck) (Fig.161)

85 mm. This shell is so variable in colouration, thickness of ribs and pattern that we have to accept the experts' verdict that the local "Harps" are just one species, namely Harpa conoidalis which is also called Harpa harpa. But it might be added that few people have been able to sort out the confusion of synonyms. One thing seems to be certain, however, that it is not identical with harpa ventricosa which is said to be found in the Gulf of Mannar and at the coast of East Africa. Comparing the two, one will find Harpa harpa is distinctly pinkish, whilst the other is reddish. Common.



Harpa Conoidalis

2. **Harpa** Sp. (Fig 162)

51 mm. The orangy-pink ribs marked by bands of three brown lines, the dark-brown and white pattern between the ribs and, first and foremost, the three alternating red blotches make this shell a real jewel. To complete the luck of the collector, a second immature specimen was added showing all the markings of the adult. Very rare.

MITRE SHELLS (MITRIDAE)

There are about 600 species of *Mitre Shells* from 7 mm. to 150 mm. long; of these 400 inhabit the Indo-Pacific region. They are generally spindle-shaped and elongate somewhat in the form of a bishop's cap or Mitre. The surface may be smooth, ridged or netted. The columella has plaits—the mark of all members of the group of Volutes—and the siphonal canal is notched.

The "Mitres" live in tropical and temperate seas worldwide. They are found in the sand in shallow waters of the lagoons among the coral and seaweeds and in other inter-tidal areas. There they hide under rocks and in the crevices during the day but come out to hunt at night.

The proboscis, or snout, of the Mitre snail is long and retractable; it is used in feeding on worms and clams. Whilst the animal burrows in search of prey the siphon is extended above the sand level. Some Mitres have been observed smothering their victim with their well developed foot the same way as olives do. Worms are killed in their tubes.

Mitres differ from Olives by having eyes near the base of the tentacles.

Several large species have been seen to discharge a dark purple mucus when disturbed; as in the case of Janthina and others—this mucus is like to be noxious and is used as a defensive weapon.

The Mitres produce their eggs in small horny capsules and attach them to stones.

1. **Mitra Guttata** (Swainson) (Fig. 163)

33 mm. The surface of the shell has finely pitted spiral grooves as well as faint vertical grooves; there are five folds on the columella; the background is greenish-brown with white irregular patches. Very rare.

2. **Mitra Ambigua** (Swainson) (Fig. 164)

21 mm. The shell is spirally grooved throughout. The fawn colour of the body whorl gradually becomes a yellowish band followed by a brown near the shoulder. The colour pattern is repeated on the succeeding whorls. Very rare.

3. **Pterygia Granulata** (Fig. 165)

22 mm. A beautiful white shell with a very short spire; the surface is regularly netted by spiral and vertical grooves giving it an almost beady pattern; every second or third spiral groove has a fine brown line; there are eight plaits on the inner lip. Very rare.

4. **Neocancilla Circula** (Kiener) (Fig.166)

36 mm. A narrow fusiform shell with a high spire. The entire surface is delicately beaded or netted and has widely spaced sharp spiral ridges. The colour of the shell is of a very light brown giving the impression of grey; each whorl has a white band at the top with a delicate brown line at the upper end. Rare.

Neocancilla Circula

5. **Neocancilla Granatina** (Lamarck). (Fig.167)

53 mm. The shell has a high spire and a long body whorl. Strong spiral ridges and grooves cover the surface of the shell, and the finer vertical grooves give it a netted aspect (under the lens); two brown spiral bands mark the body whorl whilst the ridges in between have delicate dashes. Rare.

6. **Neocancilla Clathrus** (Gmelin) (Fig.168)

35 mm. Shaped like the preceding species, the shell surface is completely beaded caused by the regular horizontal and vertical grooves. The body whorl has on a fawn background a light brown band carrying dark brown squarish blotches which are repeated (without the band) on the successive whorl. Uncommon.

7. **Vexillum Regina** (Sowerby) (Fig.169)

60 mm. A narrow, fusiform shell with a high spire and delicately grooved throughout. The shoulder of the body whorl is knobbed. The colouring of this beautiful shell is a painter's exercise in hues of grey from the lightest to the darkest shade. The colour succession varies somewhat from one specimen to another, particularly on the body whorl; yellowish-grey band, light brown line, white band, darker grey band, black line, darker grey band, brown line and a white band below the knobbed shoulder. There are three folds on the inner lip. Very rare.

8. **Vexillum Crebriliratum** (Reeve) (Fig.170)

30 mm. A narrow, fusiform shell with a high spire and close-set vertical ridges throughout. The colouration is variable from all shades of grey to a light brown. A notable feature are two white lines on each whorl; one just above the middle of a whorl and the other at the top end. Uncommon.

VOLUTES (VOLUTIDAE)

Volute Shells are large and colourful. They have strong folds fairly constant in number on the inner lip—the mark of the family. The animal is often larger than its shell can accommodate and as a consequence the operculum is wanting in most species. There are some 200 species varying from large to fairly small. Their pretty colours and patterns have made this family a favourite with collectors.

Most Volutes live in the tropics in shallow water, but some come from great depths and a few even from the polar region.

Volutes are carnivorous. The radulas have only a single longitudinal row of teeth. They are very fast and active crawlers on sandy bottoms in search of prey. Their main diet consists of molluscs and other small organisms which they smother in the folds of their large foot. Regarding speed it has been noted that many fast moving snails are also those who shells have the richest colour.

The females lay their eggs in leathery capsules.

1. **Harpulina Arausiaca** (Lightfoot) (Fig.171)

68 mm. This beautiful red and white banded shell once seen will never be forgotten. It appears to be brought up in dredging nets from some considerable depths, but the fishermen can only tell us that where they find them "it is very deep". Rare.

2. **Harpulina Loroissii** (Valenciennes) (Fig.172)

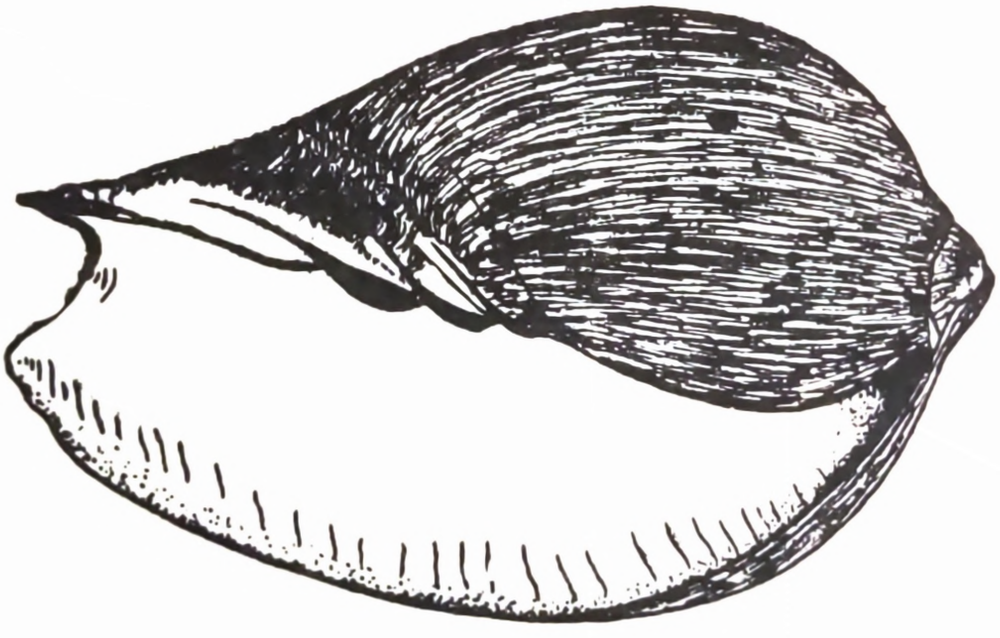
75 mm. The shell is cream-coloured and has vertical brown lines which stop just before they reach the top of each whorl. A very rare shell indeed.

3. **Melo Indica (Melo)** (Lightfoot) (Fig.173)

250 mm. The golden-yellow great *Melon Shell* has a story of its own "In its youth this shell has a well developed spire as in ordinary volutes; with growth the body of the animal increases so fast and thus the mouth whorl becomes so inflated and overgrown that the spine is eventually hidden. Strong folds are present on the columella. The adult shell is almost globular with the mouth whorl so inflated that in New Guinea a closely related species is commonly used by fishermen as a baler. Our Indian Melon-shell grows to a length of about 8 inches (20 cm.) and more. It is fairly numerous in five to six fathoms depth in Palk Bay, less numerous elsewhere. It appears therefore to prefer a bottom where a considerable amount of mud is present in the sand. The shell is pale reddish-brown blotched with a darker shade. The animal—foot, mantle and head—is striped like a tiger with yellow and black. When crawling it presents a remarkable appearance, the shell all but lost to sight in the enwrapping folds of the gorgeous mantle and foot.

The eggs are deposited in an extraordinary egg-mass, one of the strangest produced in these seas. It stands nearly a foot high, a great honey comb—like glassy cylinder made up of some hundreds of clustered capsules, each nearly an inch in length. In form and sculpture it resembles a tall cylindrical pineapple, the capsules representing the bracts. A narrow cavity perforates the centre of the cylinder. The walls of the different capsules are tough, colourless and hyaline. As in the Chank, a number of ova are deposited in each capsule, but with growth all disappear eventually but one, and this, when it frees itself by eating through the capsule's wall, is nearly an inch in length. Long before they emerge, the young may be seen clearly through the transparent walls. The spire at this time is distinctly conical and the whole shell extremely like the land-snails Bulimus and Achatina. A curious fact is that their giant egg-mass is not implanted in the sand as in the case of Chank : the parent carries the great mass with her until the young become free." (Hornell).

The brown blotches, so attractive in young specimens, sometimes completely disappear in very big shells. An albino Melon - a completely white shell - was offered to this collector for Rs. 2,000/- (but not purchased).



Melo Indica

MARGIN SHELLS (MARGINELLIDAE)

The *Margin Shells* are found in all warm and tropical waters, around the world. In some places the beaches may be littered by millions of them. West Africa is the best collecting ground for "Margins". There also is found the largest species of the family-Africvoluta springler—which grows to a size of 120 mm. and for a long time was thought to be a volute.

Most margin shells are small with only a few bigger than 1 inch (2.5 cm.) long; many of them are glossy and colourful, the very spectacular ones coming from the shallow offshore waters of West Africa. The strong folds on the inner lip and many tiny teeth on the thickened outer lip are a common feature.

The animal is an active, quickly moving predator living on clams and other snails.

The habitat of the "Margins" is varied: they may be found on sandy, muddy-detrital as well as on rocky-bottoms.

1. **Marginella Angustata** (Sowerby) (Fig.174)

24 mm. The shell is smooth, glossy and somewhat ovoid. The columella has four folds of which the lowest is small. The outer lip is thickened and white inside but has a broad yellowish-brown outer margin. It has no teeth. The surface is the colour of the outer margin with bluish spiral bands crossed by bluish vertical lines. Very common.

Marginella Angustata

2. **Marginella Loebeckeana** (Weinkauff) (Fig.175)

25 mm. This "Margin" is much wider at the posterior (upper) end than at the anterior (lower) one. On the inner lip it has five strong folds; the thick outer lip with many small teeth is white on the underside and grey above: The margin ends in a yellowish callus covering the lower three folds.: the glossy shell surface is a uniform light grey with an occasional variation for the whole shell in the colour of the callus. Uncommon.

NUTMEG SHELLS (CANCELLARIIDAE)

The *Nutmeg Shells* live in sand in tropical regions, mostly along the coast of West America. They are a small and variable group characterized by globose, well-sculptured shells with two or three strong plaits on the columellar lip. The animal has no operculum but is able to seal its aperture against attacking crabs and bristy worms with a mixture of mucus and sand.

The greatest number of "Nutmegs" is found in the Panamaic Province where over two dozen species live from the Gulf of California to Ecuador.

1. **Cancellaria Lamberti** (Sowerby) (Fig. 176)

26 mm. The spire is moderate with somewhat stepped-up whorls; the surface has distinct oblique vertical ribs with white ridges and a white band across the middle of the brown body whorl. There are three sharp plaits on the inner lip and ridges on the inside shell running up to the outer lip. Uncommon and mostly very beach-worn.

2. **Cancellaria Asperella** (Lamarck) (Fig. 177)

40 mm. The shell has a globose whorl and a shortish spire. Spiral ridges alternately thick and thin cover the whole surface; vertical ridges produce an almost net-like appearance; there are three pale-brown bands on the body whorl. Uncommon.

3. **Cancellaria Oblonga** (Sowerby) (Fig. 178).

42 mm. This shell distinguishes itself from the previous species only by its long body whorl and equally elongate spire. Very rare.

CONES (CONIDAE)

There are about 200 kinds of *Cones* in the world and over half of them can be found around the Phllippine Islands. They like the warm, tropical seas and usually occur in fairly shallow water under coral slabs and in the sandy hollows of the reef. The shells are well covered in sand and only the observant collector will recognise the conical shape for what it is.

The important fact about the cones to remember is that they are poisonous. The list is only a short one of 14 recorded species plus one to be added for Pondicherry, if it is not on it (Conus amadis). But it would be wrong to think that the rest is harmless. On the contrary, it is safer to assume that all cones are harmful until proven otherwise. Of 37 known cases of poisoning 10 ended fatally. All deaths were caused by C. geographus, C.textile (!), C.Tulipa, and took place within three to four hours after the victim had been stung. It has been observed that small fish are killed immediately on being stung, larger ones after ten minutes, and rates (injected) after four hours.

There appear to be different opinions on the exact killing process. According to some zoologists the cone snail pushes out its "teeth" and uses them like the fangs of a snake. The more acceptable suggestion, however, seems to be the following: The cone snail has a radula with two rows of arrow-shaped teeth along the sides of this ribbon-tongue. When needed, an "arrow" is triggered off the radula and passes through a poison sac; in passing it picks up some of the poisonous liquid and then is shot out through the proboscis (Sucking tube) into the victim.

My own experience with Conus amadis might add to the general information. Whilst doing "business" with some fishermen on the beach, a child slipped a shell into my left hand. Concentrating on the negotiations, I paid no attention to the shell until suddenly I felt a kind of pin prick. I opened my hand and saw to my harror the cone snail's proboscis fully extended. I knew what had happened and squeezed the pricked finger. A tiny drop of blood appeared and the spot began to itch like a mosquito bite. Nothing else developed from this, but the irritation went on for about ten days. I then remembered that stingray stings were treated with hot compresses and prepared a hot finger-bath and that ended the experience of the capability of conus amadis. There still remains the question whether I had actually been given the full dose or whether it was the last of several previous injections. Can the poison sac be so exhausted that the last shot is less potent than the first? One thing is certain though: C.amadis goes on the list of "Venomous Cones". Anyone wanting to pick up a cone do remember to grasp it at the broad (hind) end and avoid getting near the narrow end. Do not put "live" shells in your pocket either as they have been known to "shoot" through a bathing costume.

The cones feed on fish, other shellfish and all kinds of worms, especially lugworms. Small fish are killed immediately by the poison arrows and are swallowed whole. The large proboscis is pushed down the worm's burrow and the deadly weapon does its work before the prey has time to get out of reach.

Cones are entirely covered by a thick, tough skin, the periostracum; since they are mostly or always covered by sand, their beautiful patterns and colours are doubly invisible. This rises the question yet to be answered: What purpose do they serve—if any? Clusters of compressed flask-shaped egg capsules are laid on the underside of rocks in ribbon formation: in fact, they are formed on any hard surface such as a piece of coral or even an empty bivalve. Some females can deposit as many as a million eggs at one sitting.

In spite of their solid shell and deadly weapon, cones have a number of enemies such as octopusses, large fish, small triton shells and crabs.

It must be mentioned that cones, like olives, are not always popular with collectors because of the great variability in colouration and patterns. They are at times very difficult to identify, and people dislike having to write a label "Unidentified" or "Conus Sp". Fortunately, out of the 17 species found at Pondicherry only three are so variable (C. amadis, C.malacanus, C.monile) as to give the impression that they belong to ten or more different species; only experience will help sorting them out. In all cases the best means of identification is the illustration that goes with the shell.

1. **Conus Amadis** (Gmelin) (Fig.179)

Up to 85 mm. This is the commonest of the cones here. The spire is sharp and pointed and the shoulder is channelled. The body whorl has brown bands and brown reticulations on a white background. Very Common. (See illustration)

Conus Amadis

2. **Conus Figulinus** (Linne) (Fig.180)

55 mm. The shell is uniformly brown but darker on the spire. There are many darker brown lines encircling the body whorl. Common.

3. **Conus Loroisii** (Kiener) (Fig.181)

63 mm. The greyish shell has a lighter band around the middle and spiral grooves below the band. The Spire is very low with brown markings. Uncommon.

4. **Conus Monile** (Bruguiere) (Fig.182)

63 mm. This is a pretty shell with many variations, both in colour and pattern. At its best it has two orangy broad bands and two narrower white ones with lines of brown dots and dashes. These lines may form two darker bands on the orangy backgrounds. The spire is low with a sharp point and channelled and has brown markings. Common.

5. **Conus Betulinus** (Linne) (Fig.183)

95 mm. The low spire is raised to a pointed apex and has brown markings; the body whorl is inflated and makes it one of the largest cones growing to a length of 150 mm. The colour is very variable from ivory to orange-yellow with spiral rows of dots of differing shape and size. Common.

6. **Conus Tessulatus** (Born) (Fig.184)

68 mm. The orange bands and spiral rows consisting of squarish dots easily identify this species. Another feature is the purplish tip at the narrow end of the shell. Rare.

7. **Conus Zeylanicus** (Gmelin) (Fig.185)

46 mm. If anything can identify this pinky-purplish shell it is the three lines of alternating brown dots (or dashes) and white dashes on the light bands. Uncommon.

8. **Conus Textile** (Linne) (Fig.186)

90 mm. There is a whole group of textile species which all are extremely difficult to separate. Fortunately, there is only one (or so it seems) at Pondicherry—the *Textile Cone.* Uncommon. *Remember* the deadliness of this cone and treat it with the greatest respect.

9. **Conus Caracteristicus** (G. Fischer) (Fig.187)

44 mm. "A chunky shell with two bands of wavy, brown-red lines". Very rare.

10. **Conus Malaccanus** (Fig.188)

65 mm. This species is so variable as to make five different species. The spire may be flat, low or even forming a second shoulder. All they appear to have in common—more or less—are two orangy-brown bands. Rare.

11. **Conus Lividus Hwass** (Fig.189)

30 mm. A yellow-green shell with a whitish band, a coronated white spire and a purple tip. Very rare.

12. **Conus Inscriptus** (Fig.190)

50 mm. An unusual feature in this shell are the brown streaks running across the high apex from the sharp point down on to the body whorl. Another characteristic are the two white bands with two or three spiral rows of squarish brown dots. Common.

13. **Conus** Sp. (Fig.191)

35 mm. An elongate body whorl and a high spire distinguish this species from the previous one. The two brown bands are made up of three close rows of long brown dashes. The dots on the white bands differ in that they are distinctly squarish. Very rare.

14. **Conus Aculeiformis** (Fig.192)

35 mm. This shell is similar in pattern to the previous one except that both, the body whorl and the spire, are still more elongate. The main feature, however, are the rounded ridges separated by minutely beaded grooves. Very rare.

15. **Conus Acutangulus** (Fig.193)

25 mm. The body whorl is rather broad at the shoulder and the spire's height takes 1/3 of the total length of the brown shell. A band of white dashes and blotches around the middle and deep, pitted grooves are the other distinguishing marks. Very rare.

16. **Conus Generalis** (Linne) (Fig.194)

42 mm. This is a very variable species. Its top is flat with a short spire. The shell is brown with a white band around the middle of the body whorl and white blotches across its shoulder. Very rare.

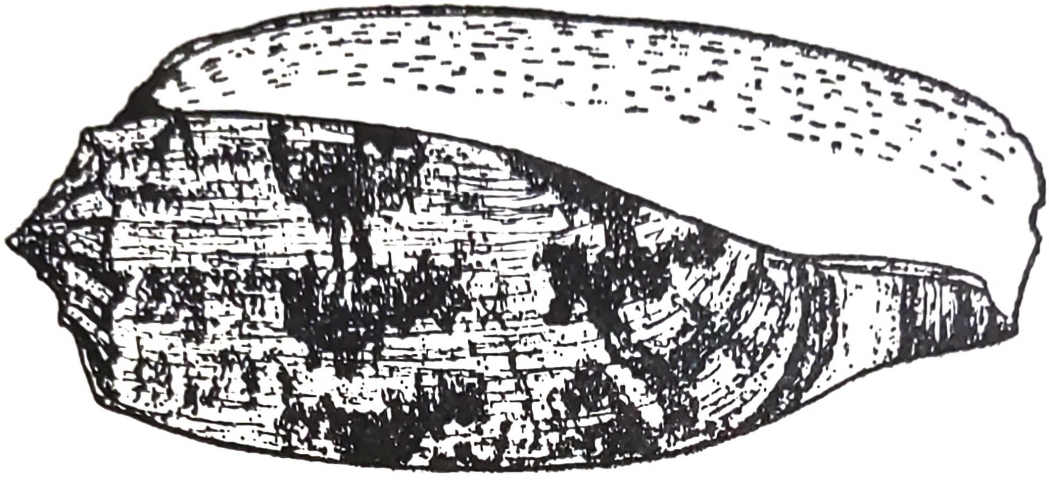
17. **Conus Inscriptus** (Albino variation) (Fig.195)

30 mm. All white. Very rare.

18. **Conus Geographus** (Linne) (Fig.196)

92 mm. The purplish-white background is covered in an irregular pattern of vertical brown zig-zag lines and small white "tents". Three brown bands cover a large part of the shell.

The sting of this cone is very poisonous and may be fatal.



Conus Geographus

AUGERS (TEREBRIDAE)

An auger is a sharp boring tool which was, and still is, used by leather-workers for making holes. It is from this tool that the *Auger Shells* got their name.

All the "Augers" are long shells with a high, pointed spire and many whorls. Often they are brightly coloured and have a distinct marking.

A plait, or fold, on the columella distinguishes an Auger from a Screw shell which has none. The other difference can only be seen in the live shells: The "Auger" has a claw-like operculum whereas that of the "Screw" is round.

The Augers are carnivorous hunters and have a radula and poison gland similar to cones. Strangely enough, no venomous stings have been recorded. This probably means that their poison is not as potent as that of the cones.

There are about 300 species of Augers in the world in tropical and subtropical seas. Most shallow water species live in the corallines and of the reef; the long and pointed shells would surely be smashed among the rocks. The snails move just below the surface of the sand but have their long siphon in contact with the water above.

1. **Terebra Commaculata** (Gmelin) (Fig.197)

100 mm. The distinct markings should be sufficient for identification: each whorl has oblong brown blotches bordered by a white ridge with thin brown dashes. This must not be confused with Terebra Subulata which has two rows of brown squarish blotches on each whorl. Rare.

2. **Terebra Babylonia** (Lamarck) (Fig.198)

73 mm. Each whorl of this yellowish-brown shell has a distinct pattern to be seen best under a lens: (going up) two narrow ridges, two wider ridges, one beaded ridge, one beaded ridge double the width of the preceding one. Rare.

3. **Terebra Triseriata** (Gray) (Fig.199)

65 mm. This shell could almost be mistaken for the previous species, but on close inspection the sculpturing is really quite different: all the ridges are beaded and the two wider ridges more distinctly so. A beautiful shell and very rare.

4. **Duplicaria Duplicata** (Linne) (Fig.200)

75 mm. The flat vertical ridges are separated by deep grooves. Each colour band, too, is separated by a deep, sharp spiral grooves. The colours are variable from a purplish grey to brown with narrow whitish bands. The whole shell has a beautiful glazed appearance.

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Duplicaria Duplicata

5. **Hastula (Terebra)** Strigilata (Fig.201)

25 mm. The grey whorls have flat vertical ridges as in Duplicaria duplicata. At the top of each whorl is a white band with a row of squarish brown dots. This shell too is glossy. Very rare.

6. **Duplicaria Raphanula** (Lamarck) (Fig.202)

47 mm. The vertical ridges of the two preceding species have almost disappeared on this shell though they are still noticeable. The importance for identification is in the colour pattern repeated on each whorl: a band of light-brown squarish blotches, a narrow white band, a narrow brown band, a broad brown band. This shell too has a glossy surface. Very rare.

TURRET SHELLS (TURRIDAE)

The *Turret Snails* are highly evolved creatures and their shells are known from geological deposits at least a hundred million years old. They form a successful group, there being some 1,200 species of which Japan alone has some 400. This makes them one of the biggest family of molluscs. Their sizes vary immensely from 2.5 mm. to 125 mm. shapes too are variable. The snails are found in deep and shallow water in all parts of the world. They are carnivorous and feed on worms.

Generally the "*Turrets*" have a turret-shaped spire and a longish siphonal canal. The slit in the posterior, or upper, half of the outer lip distinguishes this family from the Auger and Screw shells. It is through this anal notch that the snail expels waste matter from the mantle cavity. Although the notch is clearly seen in some species, it may be scarcely perceptible in others.

The "*Turrets*", like the Cones and the Augers, use poison darts to harpoon their prey. In most forms of this family the radula teeth have been reduced to a single row from which the poison arrows are released. No human casualties have been reported.

1. **Turris Indica** (Fig.203)

102 mm. The body whorl and the spire of the snail together are about as long as the siphonal canal. The shell is brown with strong white dashes on the sharp spiral ridges; there are fainter white dashes on the lesser ridges in between. Note that the lowest sharp ridge begins exactly at the end of the siphonal notch. Very common.

2. **Turris Variegata** (Fig.204)

110 mm. The siphonal canal is much shorter in this shell than in the preceding species. The shell is white with brown dots and blotches. Note that the anal notch is above the lowest pronounced spiral ridge with brown dots. This is followed above by two lesser ridges with close regular brown dots and farther above a row of brown blotches. Very common.

3. **Turris Nelliae** (Fig.205)

55 mm. This is a light brown shell with five grooves and a spiral ridge on the shoulders of the whorls consisting of a row of close, regular, vertical beads. Uncommon.

4. **Turricula Javana** (Linne) (Fig.206)

57 mm. The brownish - yellow shell has a spiral row of knobs on the

whorls' shoulders and a wide notch at the posterior end of the aperture. Uncommon.

Turricula Javana

5. **Turricula Tornata** (Fig.207)

79 mm. A very smooth shell with rounded shoulders and no sculpturing of any kind. It is yellowish brown with whitish vertical streaks. The turrid notch is rather wide. Rare.

6. **Brachytoma Crenularis** (Lamarck) (Fig.208)

35 mm. The surface of the whorls is spirally ridged ; the shoulders carry a row of yellowish knobs producing the effect of a crenulated ridge. The turrid notch is close to the end of the outer lip. Three bands of different browns between the crenulations. Uncommon.

Brachytoma Crenularis

7. **Drillia Sacra** (Reeve) (Fig.209)

27 mm. A shell with a long spire and a short canal. Vertical varix like ribs on all whorls though less prominent on the body whorl ; a beading effect produced by spiral grooves. A large notch will be found at the top of the outer lip. The body whorl is a brownish yellow whilst the spire may be the same colour or a shade darker. Very rare.

8. **Drillia Umbilicata Gray** (Fig.210)

32 mm. All whorls of this shell are heavily knobbed and slightly grooved. Its colour is a darkish fawn but the knobs are of a lighter shade. A brown band may be discovered on the body whorl below the knobs. Very rare.

BUBBLE SHELLS

The name *Bubble shells* is suggested by the bubble like shape of most of them. It actually covers three superfamilies ; *Acteonacea, Philinacea* and *Bullacea,* all being represented in Pondicherry.

The *"Bubbles"* are mostly tropical and live on sandy bottom in shallow water. Like other sand - dwellers, they have a large foot with which they plough through the soft sand in search of their food. Being carnivorous, they will eat any small creatures caught in their burrowing including other hard-shelled molluscs which are swallowed alive.

A hard shell does not worry the carnivorous kind of *"Bubble"* for it has an unusual gizzard made up of two strong side plates standing on a base plate. This "gadget" is powerful enough to crush and grind any solid calcareous matter to get at the fleshy parts of the prey.

The snails in this group are hermaphrodite, that is, each individual has a set of both male and female organs. They are capable of producing long ribbons of thousands of eggs. When these hatch, the free-swimming larval young drift through the water to new areas and finally settle down on the bottom as miniature adults.

Hydatina Velum (Gmelin) **(Acteonacea)** (Syn. H. Zonata Lightfoot) (Fig.211)

37 mm. "An extremely beautiful animal is the *Striped Bubble Shell* (Hydatina Velum). The shell has the form of a Bulla but is thin and fragile and ornamented with broad spiral black bands on a pale ground. The foot is very broad the snail is a sand dweller ; the head disc is extremely large. The true tentacles are wide and earshaped and of comparatively enormous size. The colouring of the foot is of a grey similar to the shell. It is a wonderful sight to see this creature when crawling in a pool, the shell partly uncovered, the great head with its elephant ear tentacles stretched forwards and the wide side-folds partly reflected, undulating gracefully over roughnesses of the ground". (Hornell).

Like many other Pondicherry shells this one, too, seems to be very seasonal, around the middle of September, Uncommon.

Life appearance of *Hydatina velum* Gmelin.

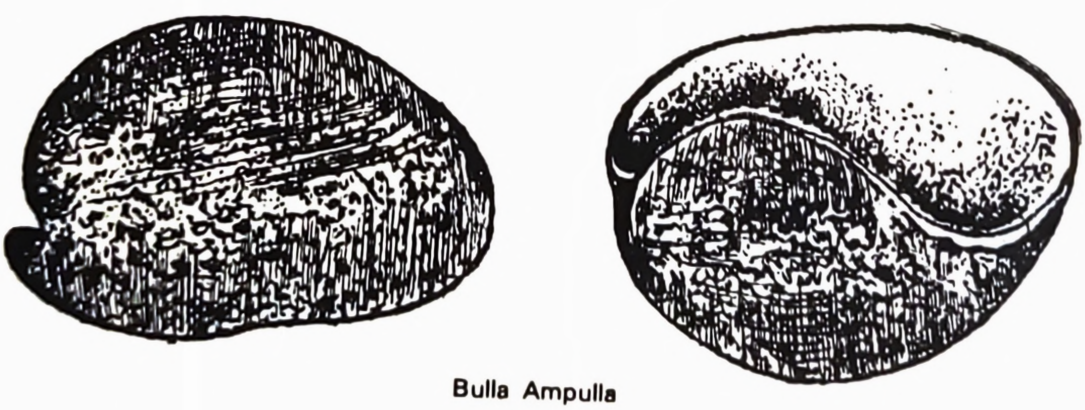
2. **Pupa Solidula** (Linne) **(Acteonidae)** (Fig.212)

19 mm. The whitish shell is more or less egg-shaped with a short conical spire and a sharply pointed apex. The surface is covered by close-set spiral ridges, separated by strongly impressed grooves. Each ridge is marked with squarish black dots and dashes. The columella has a double fold. Uncommon.

Pupa Solidula

3. **Bulla Ampulla** Linne **(Bullacea)** (Fig.213)

45 mm. "The swollen oval shell of this species seemingly all mouth, mottled with pale transparent brownishred, are often thrown ashore on our sandy beaches. In life none of the shells is seen, the fleshy lobes of the foot being reflected over the shell both at the side and behind. In front the foot, as in many other burrowing molluscs, Natica and Oliva, for example, forms a stout head shield, the equivalent of a plough share". (Hornell) Uncommon.



Bulla Ampulla

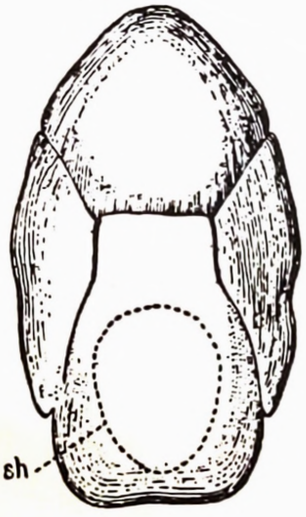
4. **Atys Naucum** (Linne) (Fig.214)

45 mm. The shell is shaped like Bulla ampulla, but thin, transparent and all white. Very rare.

5. **Philine Orientalis (Philinacea)** (Fig.215)

25 mm. "In the *Philinidae* the form of the body is fully specialized for burrowing. The shell has become thin and small, the spire almost lost, and the aperture wide and earshaped ; it is embedded entirely and there is therefore no longer a clumsy projecting mass on the back as in Natica, Oliva and Bulla, to hinder easy progress through sand. The lobes of the body are fleshy and smooth, without projections, the whole an animated ploughshare, perfect for the purpose of burrowing rapidly like Bulla ; it has a powerful gizzard armed with a crushing apparatus composed of three shelly plates. The common Indian species of philine is shapeless in appearance, a mere mass of four fleshy lobes. It is not uncommon in soft, wet, sand". (Hornell).

A few of these extremely fragile shells have been retrieved from fisherman's nets. They were however, in perfect condition on account of the protection given by their lobes. Uncommon.



Living appearance of *Philine,* dorsal view ; the dotted line outlines the position of the shell embedded in the mantle.

Fig. 1 CELLANA RADIATA (Born)

Fig. 2 TROCHUS RADIATUS (Gmelin)

Fig. 3 UMBONIUM VESTIARIUM (Linne)

Fig. 4 CALLIOSTOMA TRANQUEBARICA (Roeding)

Fig. 5 EUCHELUS ASPER (Gmelin)

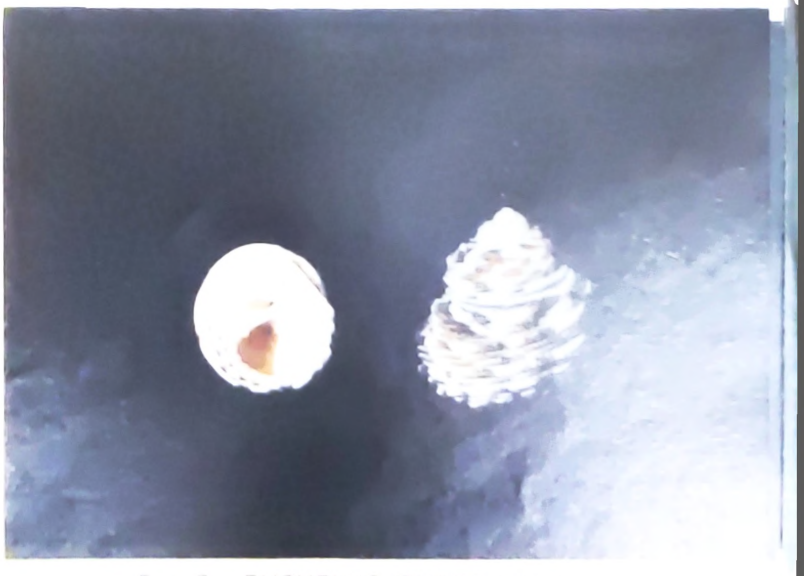


Fig. 6 EUCHELUS QUADRICARIN

Fig 7 EUCHELUS ATRATUS (Gmelin)

Fig 8 TURBO INTERCOSTALIS (Menke)

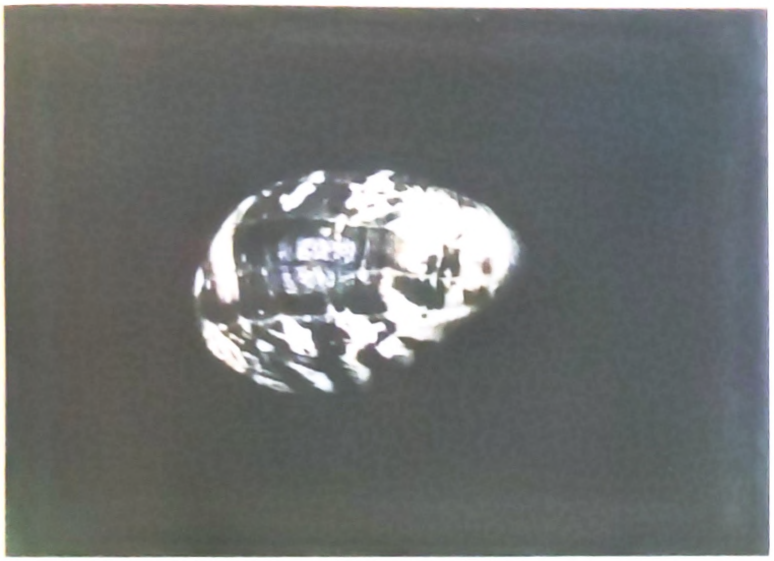


Fig 9 NERITA ALBICILLA (Linne)

Fig 10 NERITA POLITA (Linne)

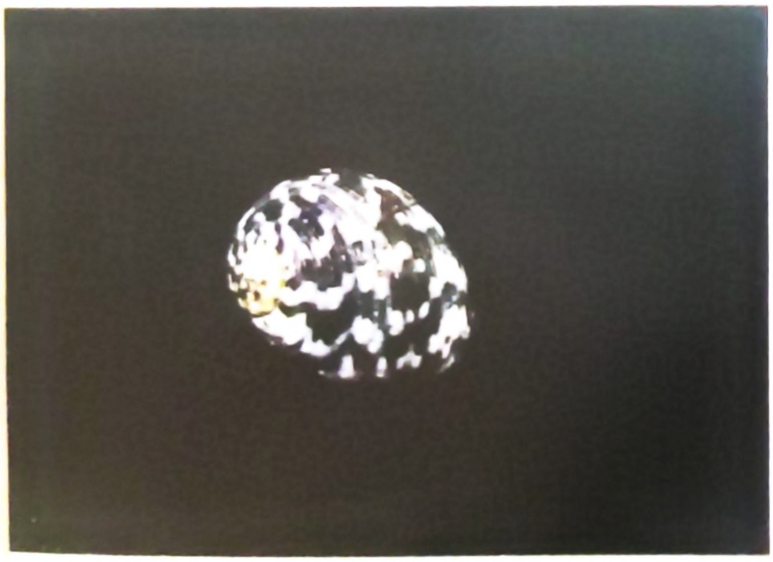


Fig 11 NERITA CHAMAELEON (Linne)

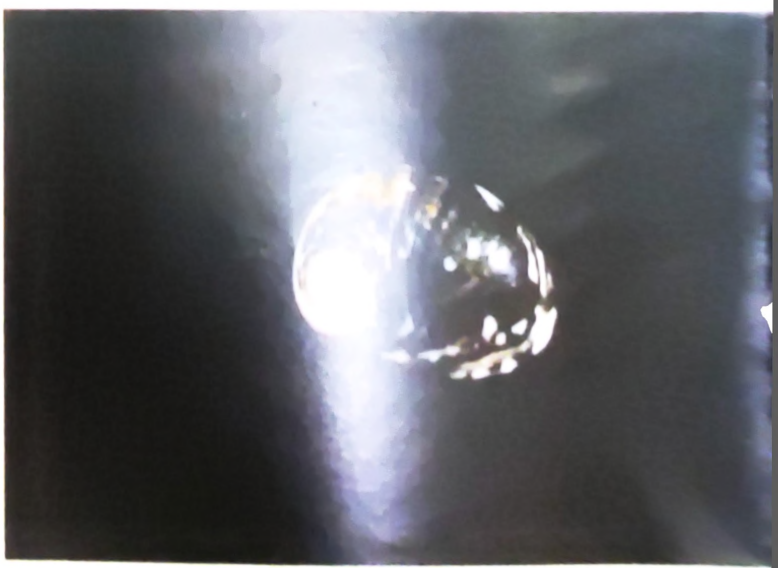


Fig 12 NERITA MAURA (Recluz)

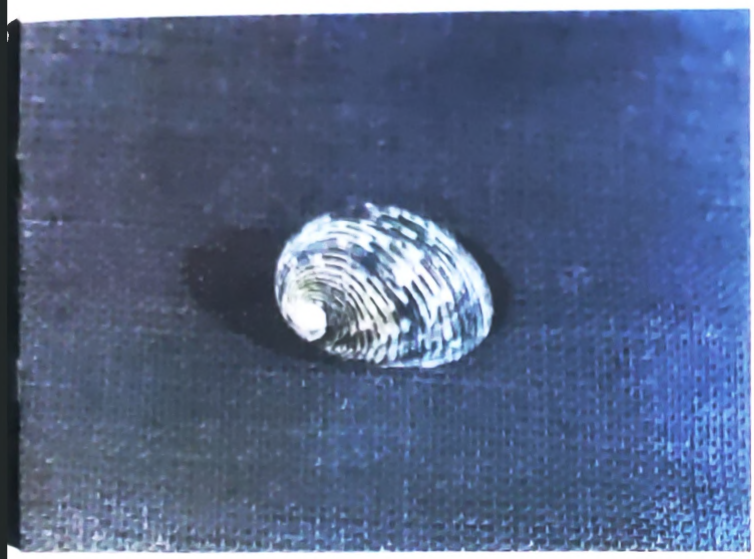


Fig. 13. NERITA Sp.

Fig. 14. TURRITELLA DUPLICATA (Lamarck)

Fig. 15. TURRITELLA ATTENUATA (Reeve)

Fig. 16. TURRITELLA COLUMNARIS

Fig. 17 ARCHITECTONICA PERSPECTIVA (Linne)

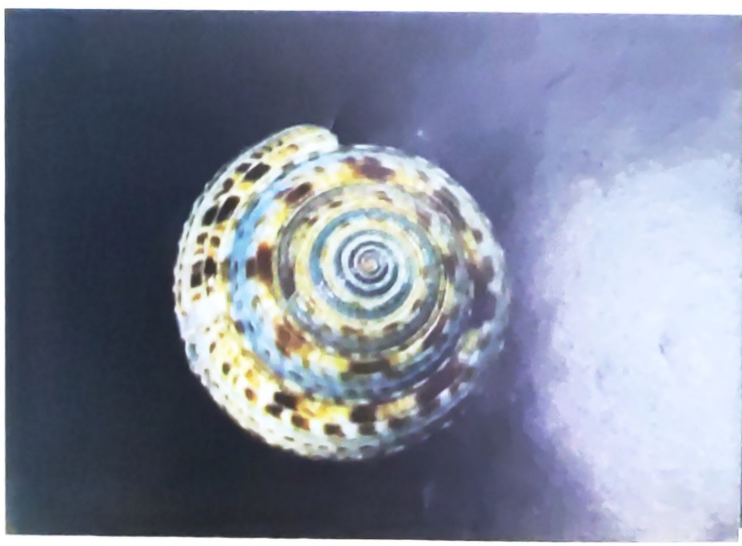


Fig. 18 ARCHITECTONICA PURPURATA (Hinds)

Fig. 19 ARCHITECTONICA LAEVIGATA (Lamarck)

Fig. 20 ARCHITECTONICA PERDIX (Hinds)

Fig. 21 ARCHITECTONICA Sp.

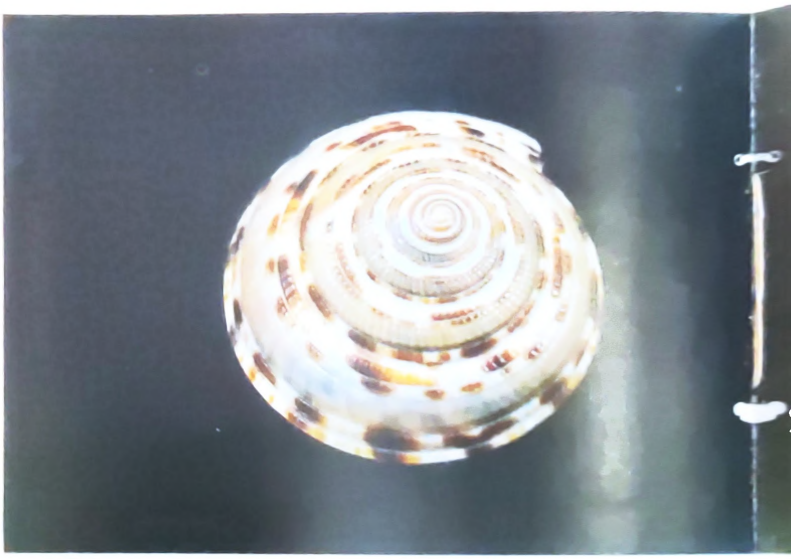


Fig. 22. ARCHITECTONICA Sp.

Fig. 23 ARCHITECTONICA Sp

Fig. 24 ARCHITECTONICA Sp

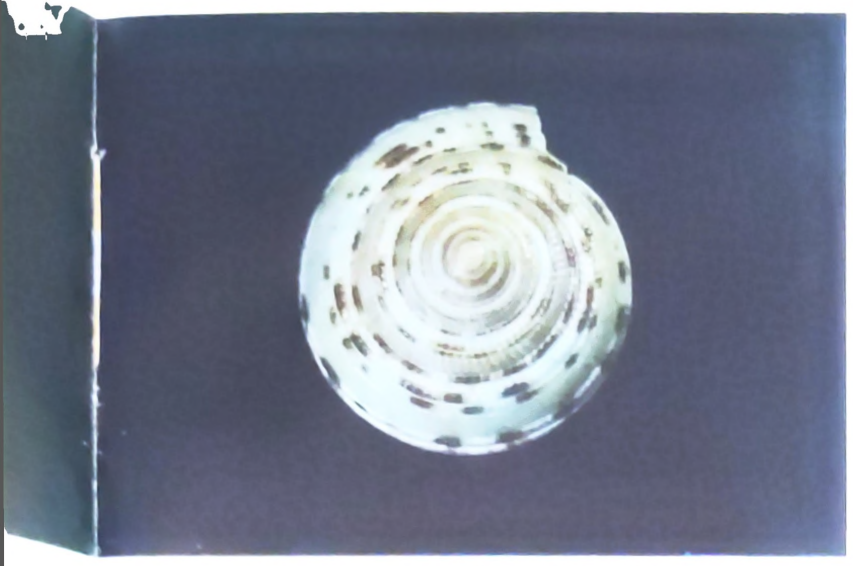


Fig. 25 ARCHITECTONICA Sp.

Fig. 26 HELIACUS STRAMINEUS (Gmelin)

Fig. 27 CERITHIACEA CINGULATA (Gmelin)

Fig. 28 TELESCOPIUM TELESCOPIUM (Linne)

Fig. 29 TEREBRA PALUSTRIS (Linne)

Fig. 30 BALCIS MARTINII

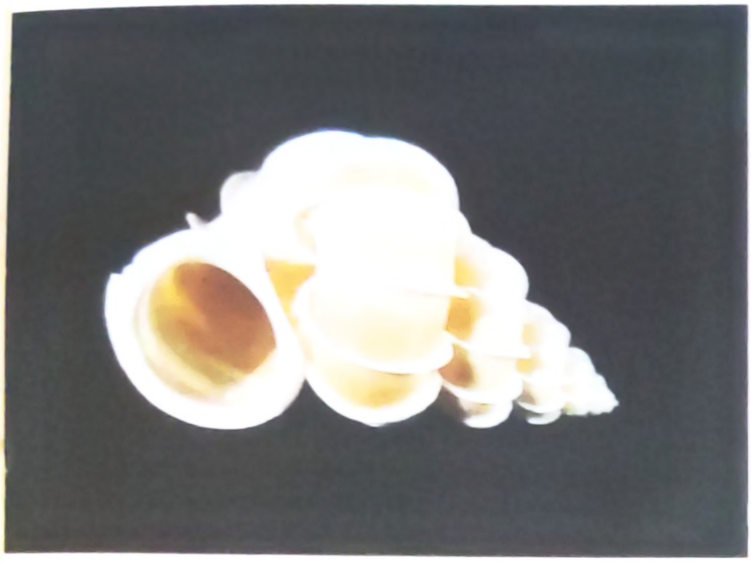


Fig. 31 EPITONIUM SCALARE (Linne)

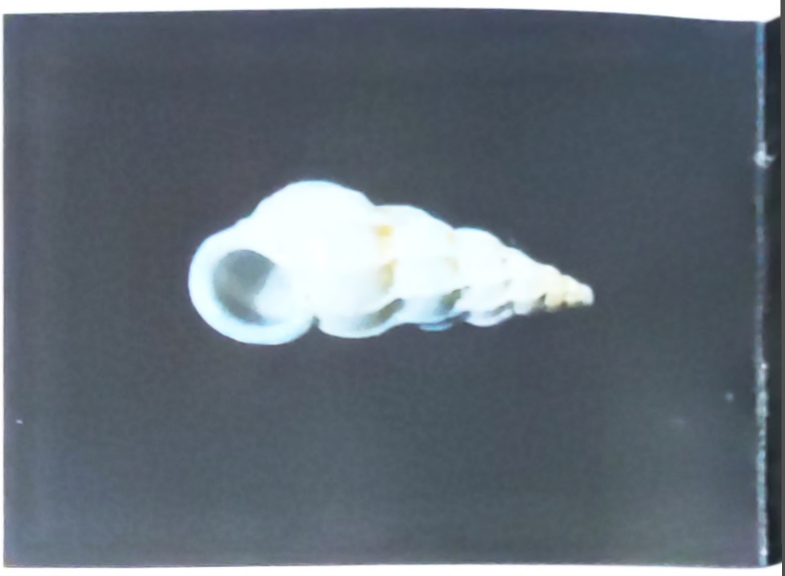


Fig. 32 EPITONIUM LAMELLOSUM (Lamarck)

Fig. 33 JANTHINA JANTHINA (Linne)

Fig. 34 JANTHINA GLOBOSA (Swainson)

Fig. 35 CREPIDULA WALSHI (Hermannsen)

Fig. 36 CRUCIBULUM EXTINCTORIUM (Lamarck)

Fig. 37. XENOPHORA CORRUGATA (Reeve)

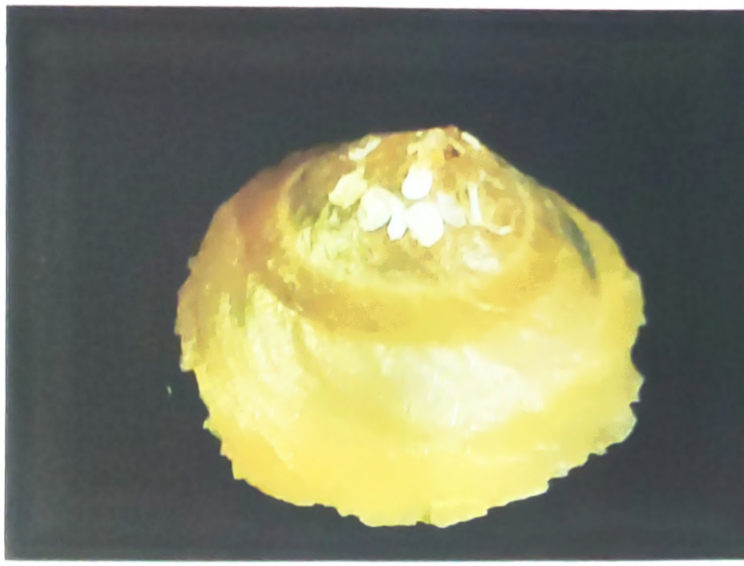


Fig. 38. ONUSTUS HELVACEA (Philippi)

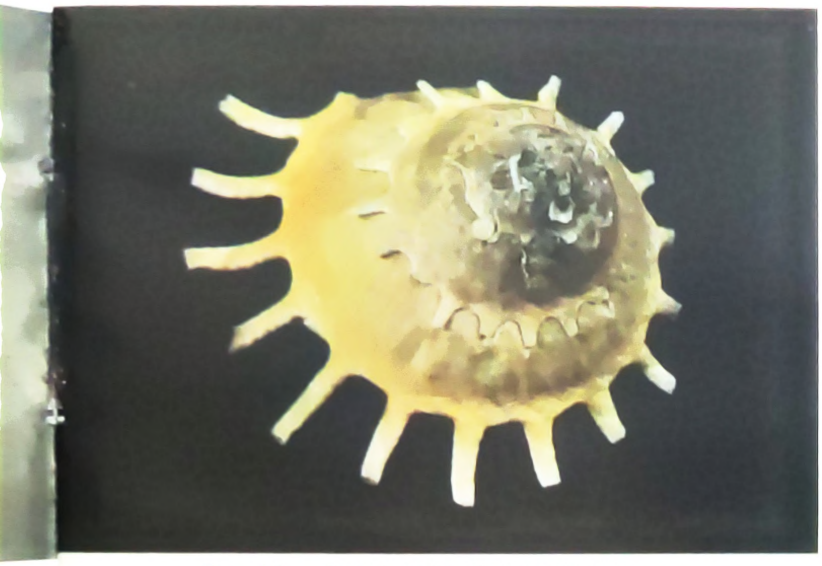


Fig. 39. STELLARIA SOLARIS (Linne)

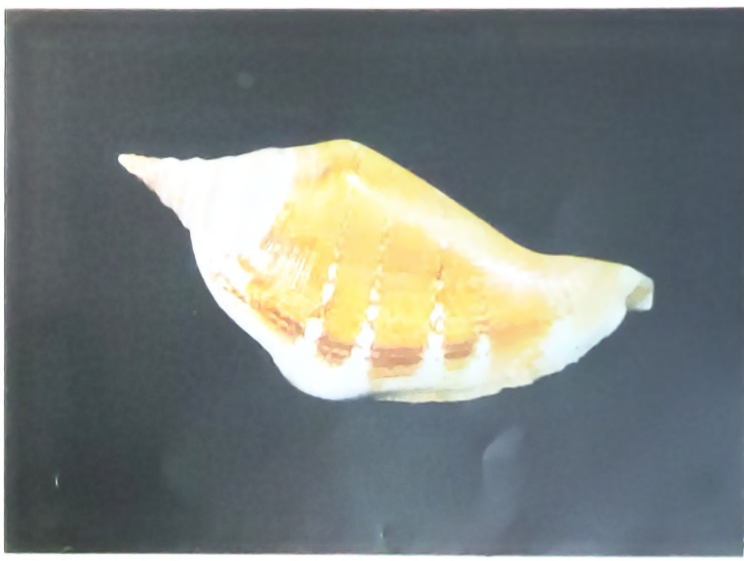


Fig. 40. STROMBUS MARGINATUS SUCCINCTUS

Fig. 41. STROMBUS MARGINATUS (Linne)

Fig. 42. STROMBUS MUTABILIS (Swainson)

Fig. 43 STROMBUS PLICATUS (Reeve)

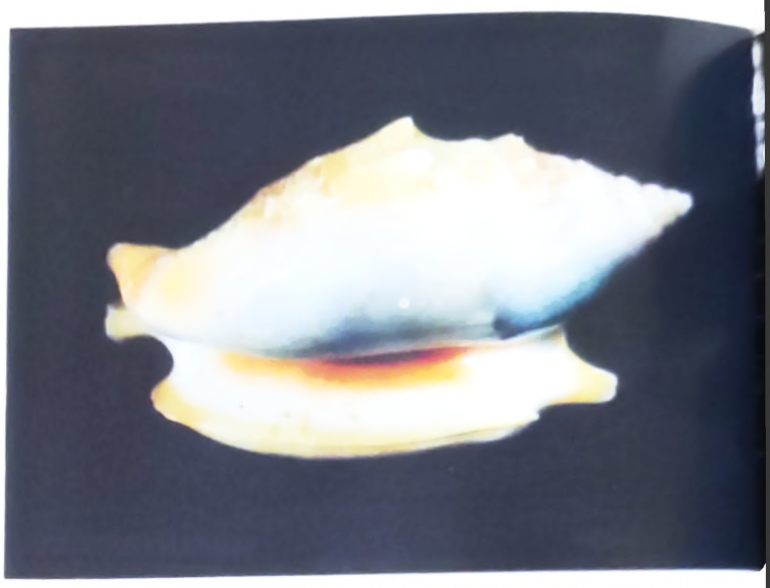


Fig. 44. STROMBUS AURIS-DIANAE (Linne)

Fig. 45 STROMBUS LISTERI (Gray)

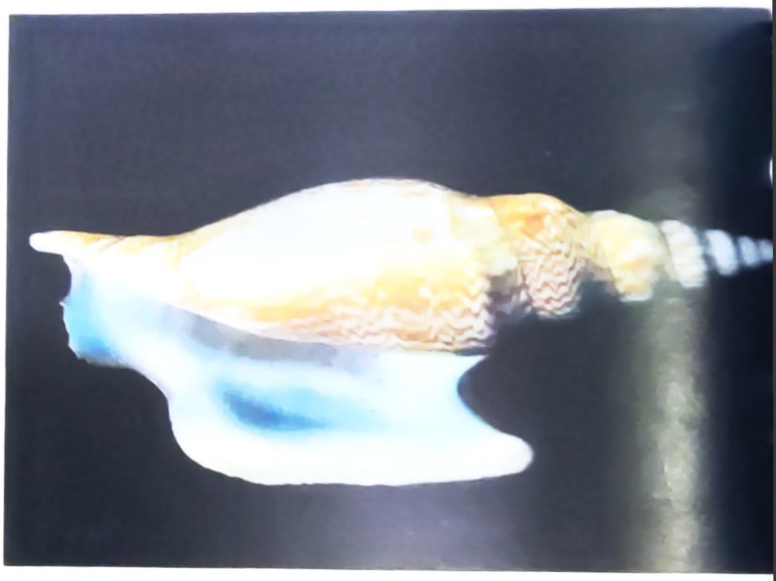


Fig. 45a. STROMBUS LISTERI (Gray)

Fig 46 TIBIA CURTA (Sowerby)

Fig 47 LAMBIS ARTRITI[illegible] (Roeding)

Fig 48 TEREBELLUM TEREBELLUM (Linne)

Fig.49. VARICO SPIRA CANCELLATA (Lamarck)

Fig 50 NATICA DIDYMA (Roeding)

Fig.51. NATICA LINEATA (Lamarck)

Fig 52 NATICA ALBULA (Roeding)

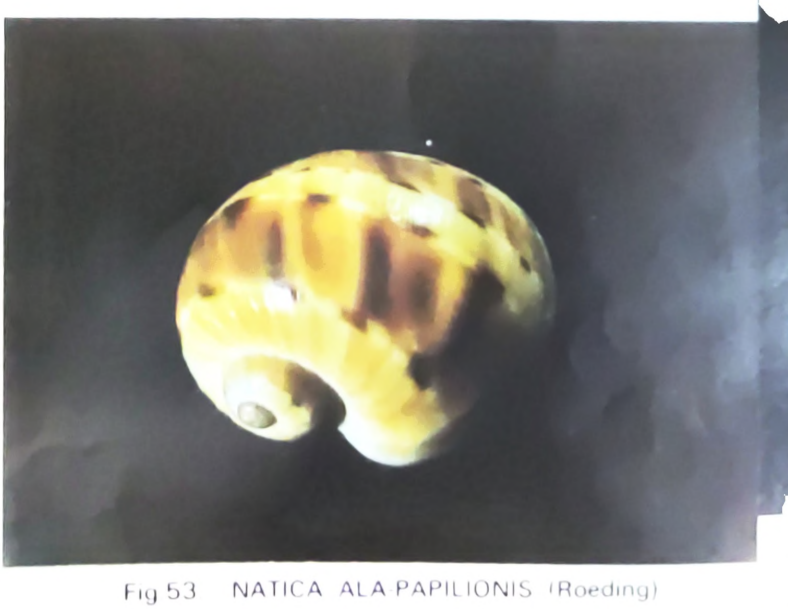


Fig 53 NATICA ALA PAPILIONIS (Roeding)

Fig.54 NATICA PICTA

Fig.55 NATICA GUALTERIANA (Recluz)

Fig.56 NATICA TIGRINA (Roeding)

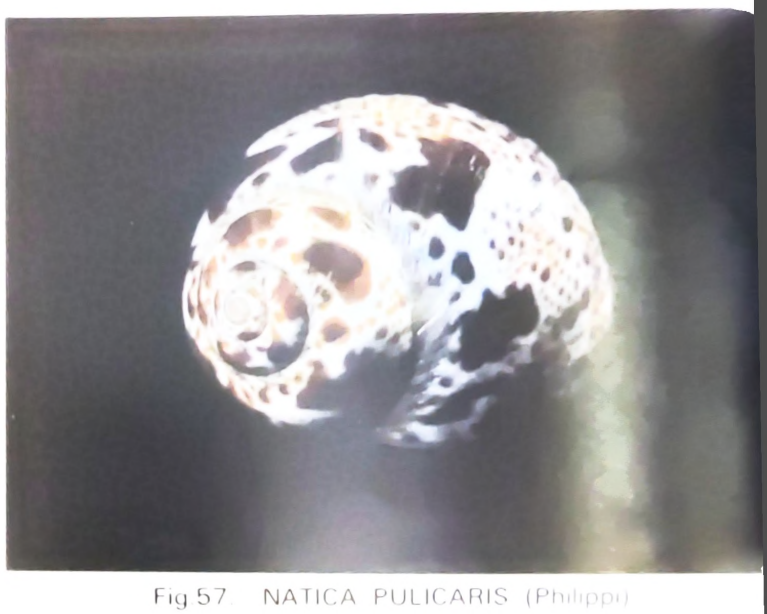


Fig.57 NATICA PULICARIS (Philippi)

Fig.58 NATICA ARACHNOIDEA (Gmelin)

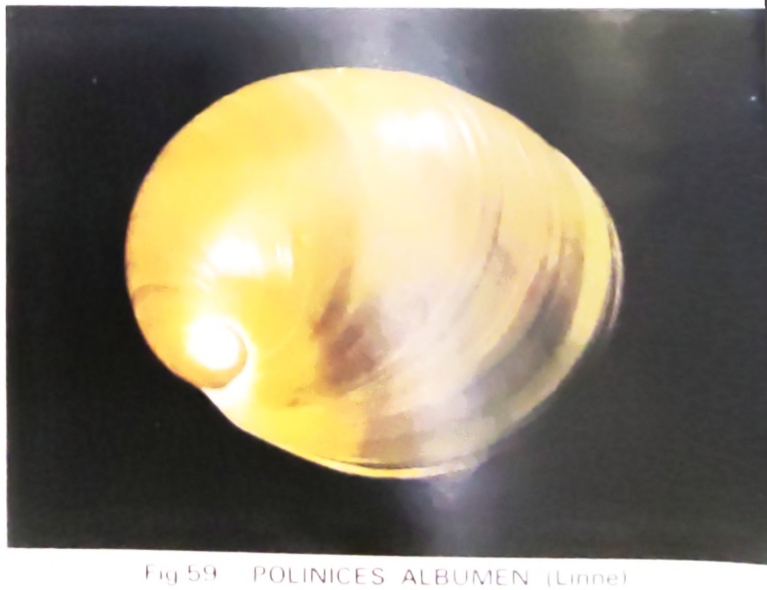


Fig.59 POLINICES ALBUMEN (Linne)

Fig.60. POLINICES PES-ELEPHANTI (Link)

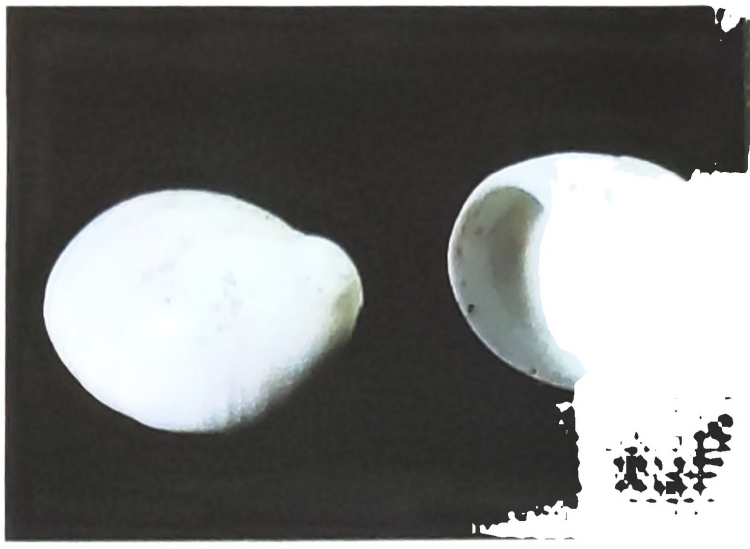


Fig.61. POLINICES MAMILLA (Linne)

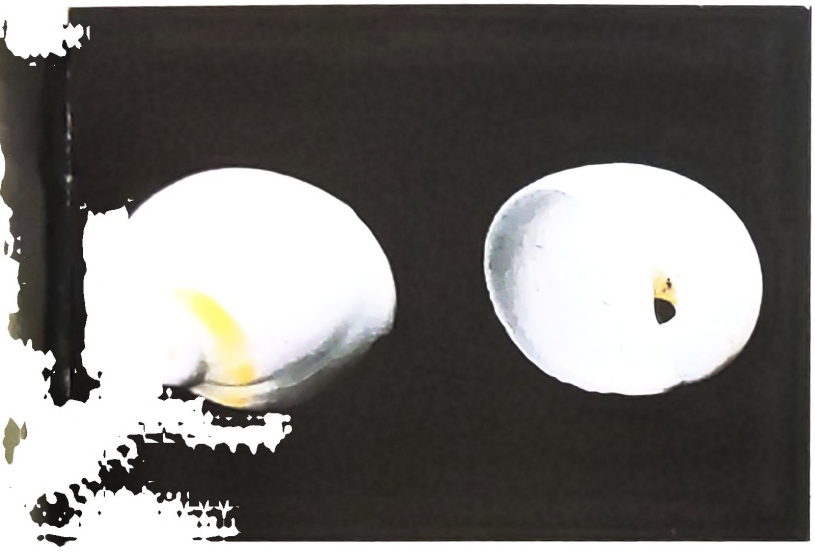


Fig.62. POLINICES TUMIDUS (Swainson)

Fig.63. POLINICES MELANOSTOMUS (Gmelin)

Fig.64. POLINICES MELANOSTOMOIDES

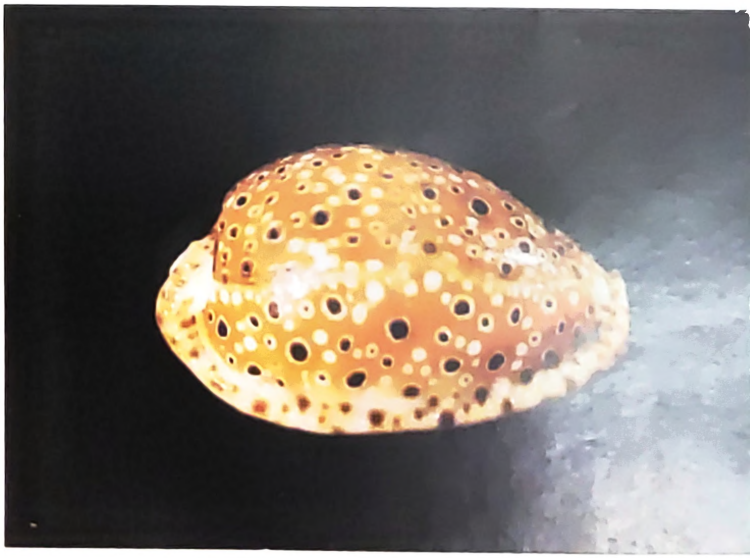


Fig.65. CYPRAEA OCELLATA (Linne)

Fig 68 CYPRAEA ONYX (Linne)

Fig 67 CYPRAEA [illegible]

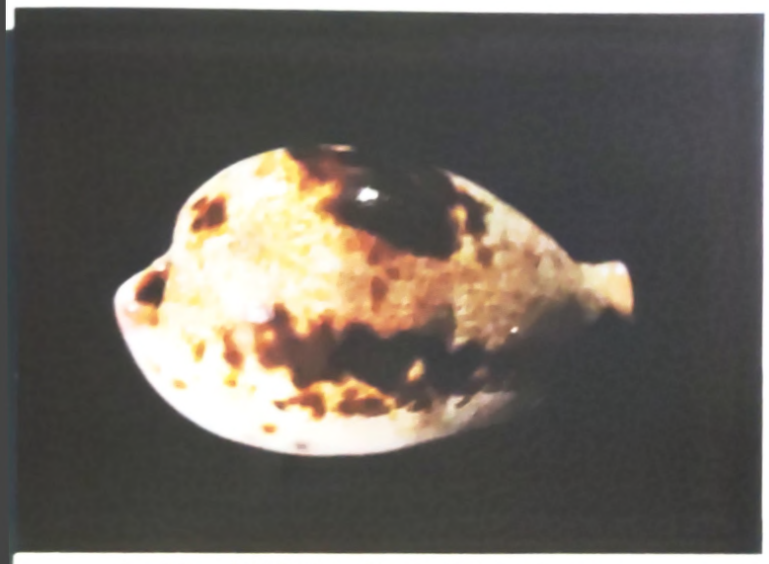


Fig 68 CYPRAEA PULCHELLA (Swainson)

Fig 69 CYPRAEA [illegible]

Fig 70 CYPRAEA ARABICA (Linne)

Fig 71 CYPRAEA HISTRIO (Gmelin)

Fig.72. CYPRAEA MAPPA (Linne)

Fig.73. CYPRAEA NIVOSA (Broderip)

Fig.74. CYPRAEA CARNEOLA (Linne)

Fig.75. CYPRAEA EROSA (Linne)

Fig.76. CYPRAEA PALLIDA

Fig.77. CYPRAEA MONETA (Linne)

Fig.84 PHALIUM AREOLA (Linne)

Fig.85. CASMARIA PONDEROSA (Gmelin)

Fig.86 CASMARIA ERINACEUS VIBEX (Linne)

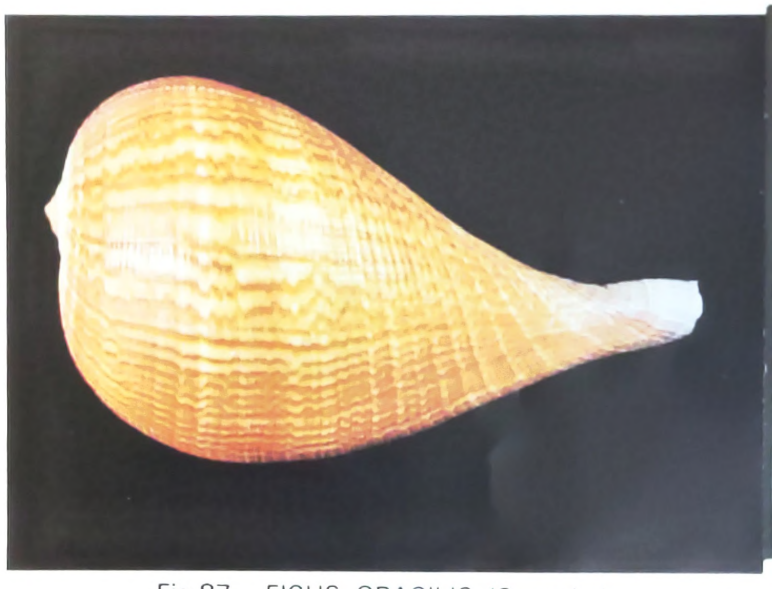


Fig.87. FICUS GRACILIS (Sowerby)

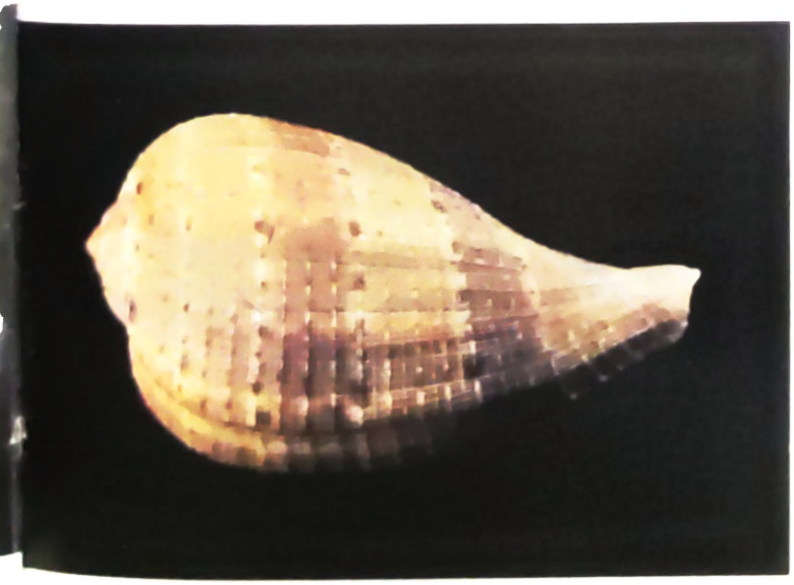


Fig.88 FICUS FICOIDES (Lamarck)

Fig.89 FICUS SUBINTERMEDIUS (D'Orbigny)

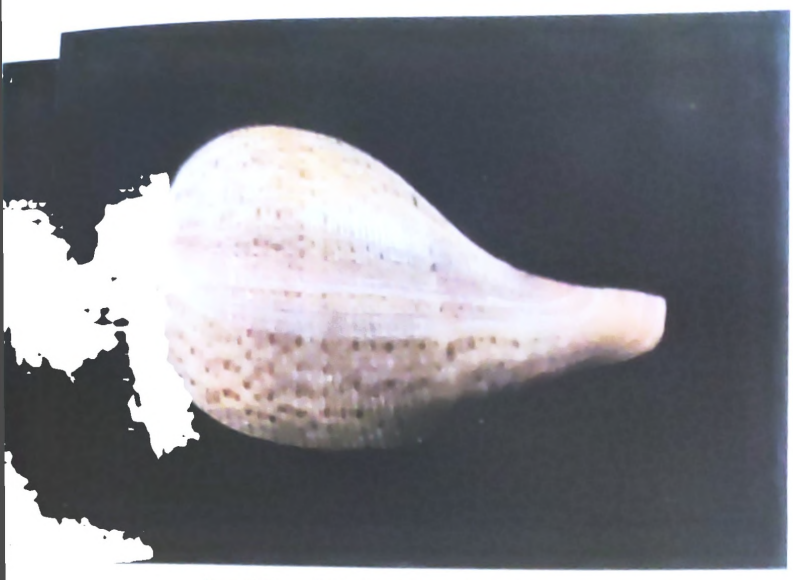


Fig.90. FICUS FICUS (Linne)

Fig.91. TONNA GALEA (Linne)

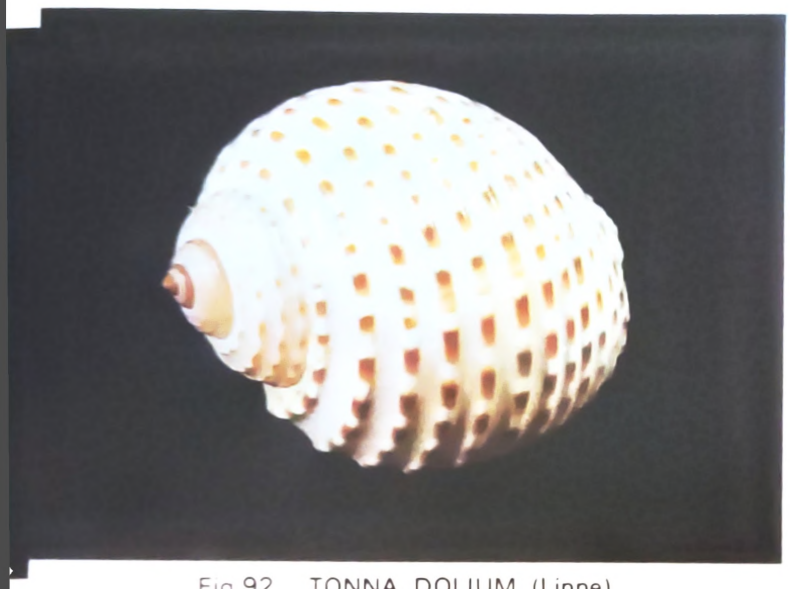


Fig.92. TONNA DOLIUM (Linne)

Fig.93. TONNA CUMINGII (Reeve)

Fig.94. CYMATIUM PERRYI (Emerson & Old)

Fig.95. CYMATIUM PILEARE (Linne)

Fig.96 CYMATIUM TRIPUS (Lamarck)

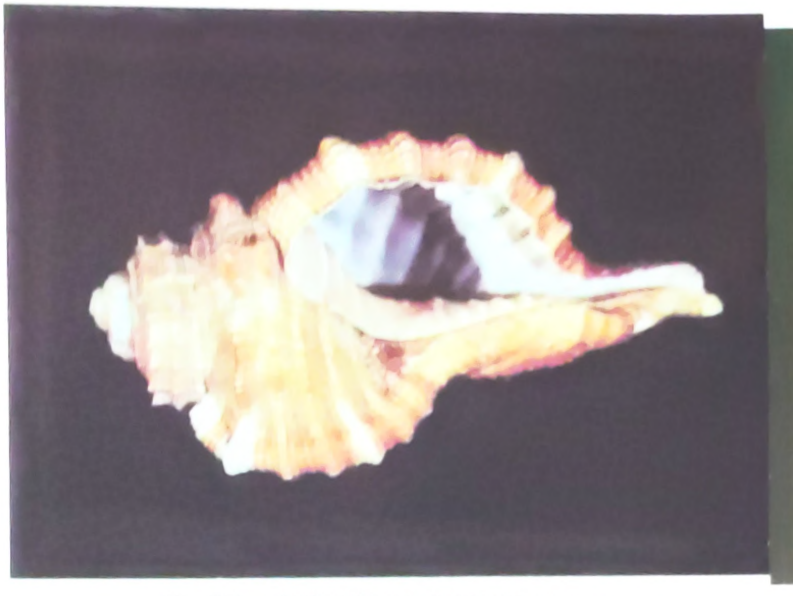


Fig.97 CYMATIUM PYRUM (Linne)

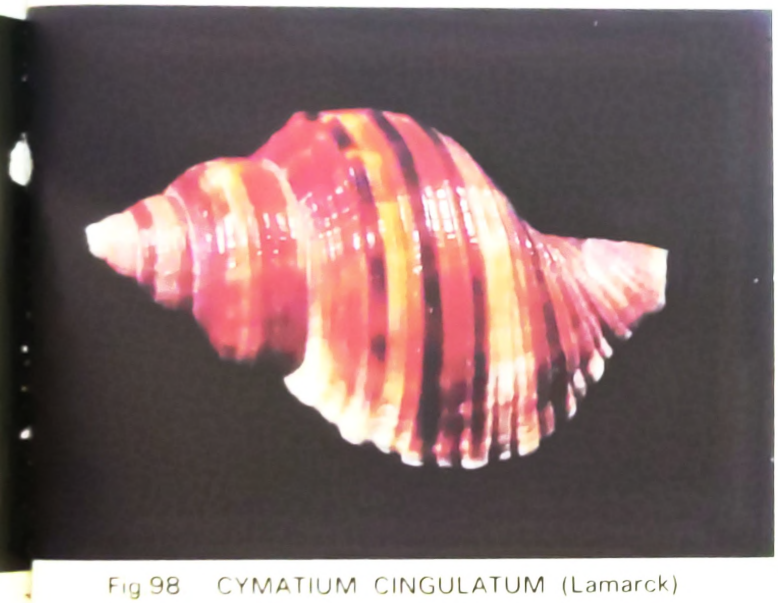


Fig.98 CYMATIUM CINGULATUM (Lamarck)

Fig.99 CYMATIUM RETUSA (Lamarck)

Fig.100 CYMATIUM MURICINUM (Roeding)

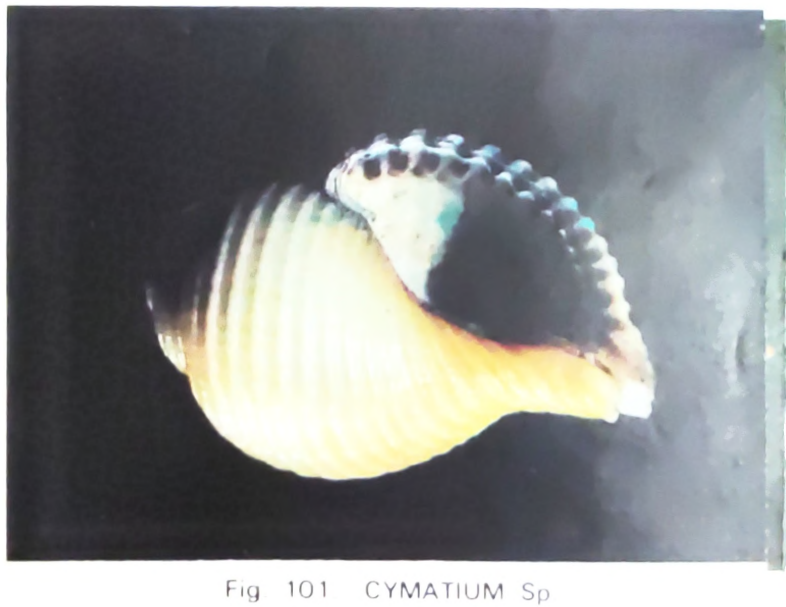


Fig. 101 CYMATIUM Sp

Fig. 102. GYRINEUM NATATOR (Roeding)

Fig. 103. BIPLEX BITUBERCULARIS (Lamarck)

Fig. 104. DISTORSIO RETICULATA (Roeding)

Fig. 105. BURSA SPINOSA (Lamarck)

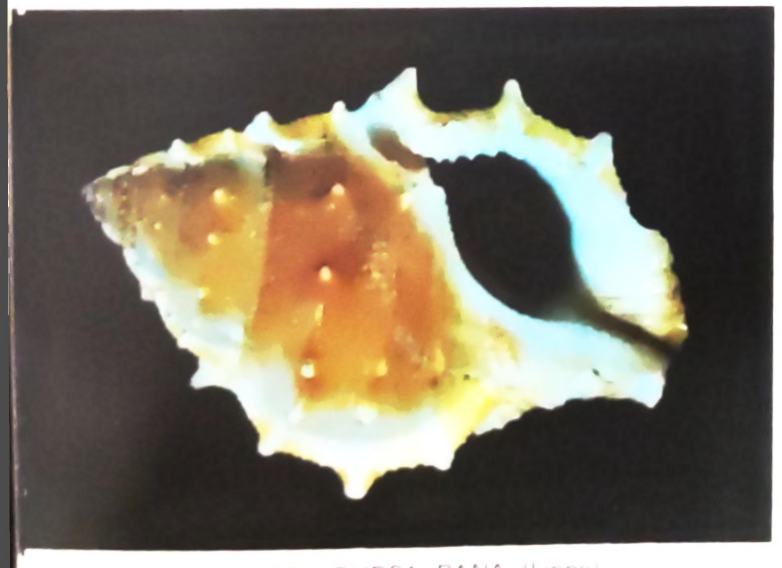


Fig. 106. BURSA RANA (Linne)

Fig. 107. BURSA CRUMENA (Lamarck)

Fig 108 BURSA MARGARITULA (Deshayes)

Fig 109 BURSA GRATA ARA (Broderip)

Fig 110 BURSA RUBETA (Linne)

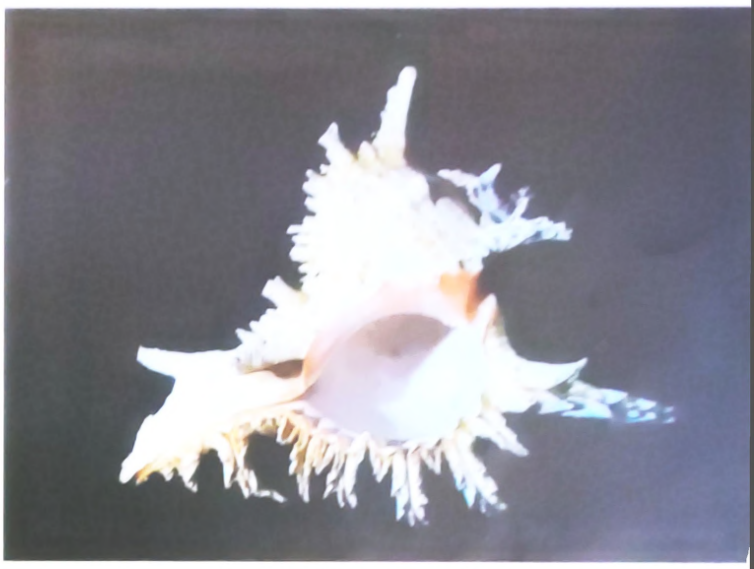


Fig 111 CHICOREUS RAMOSUS (Linne)

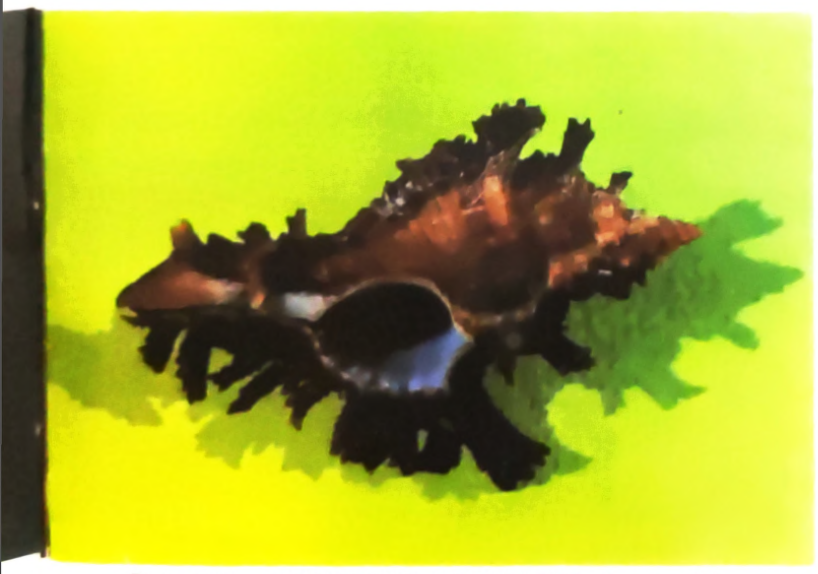


Fig 112 CHICOREUS ACULEATUS (Lamarck)

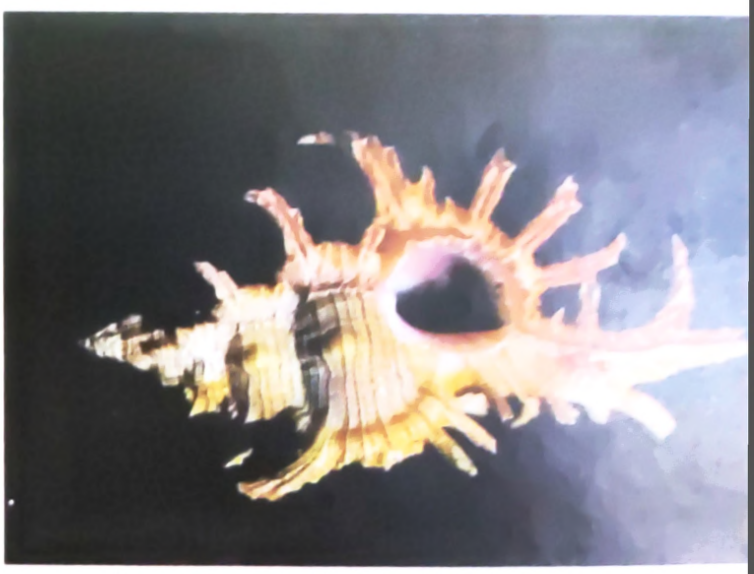


Fig 113 CHICOREUS ROSSITERI (Crosse)

Fig. 114. CHICOREUS ADUSTUS (Lamarck)

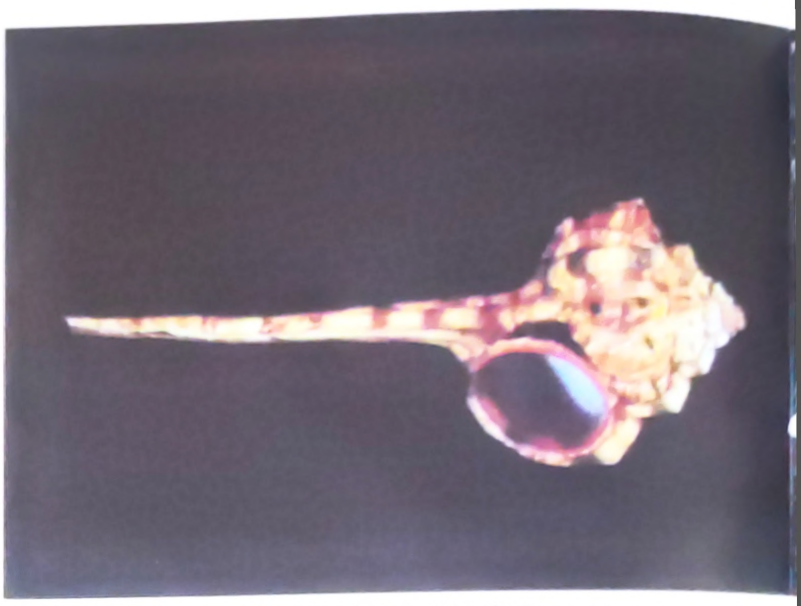


Fig. 115. HAUSTELLUM HAUSTELLUM (Linne)

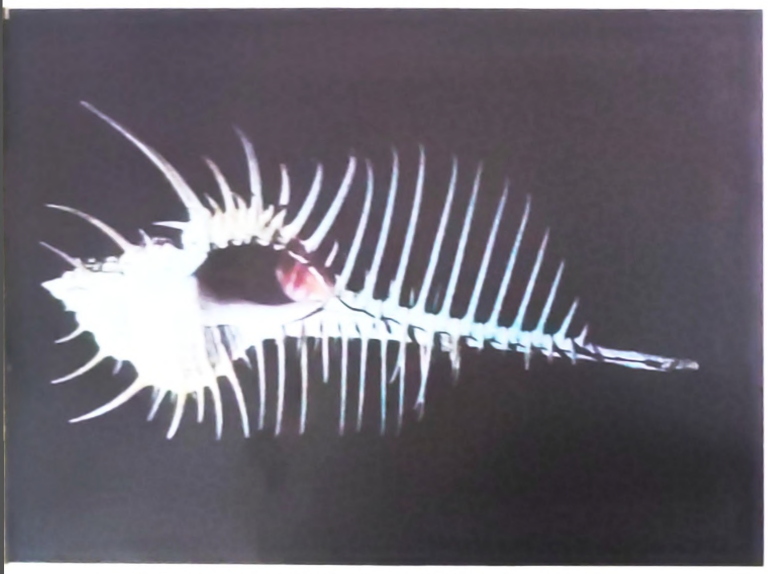


Fig. 116. MUREX PECTEN (Lightfoot)

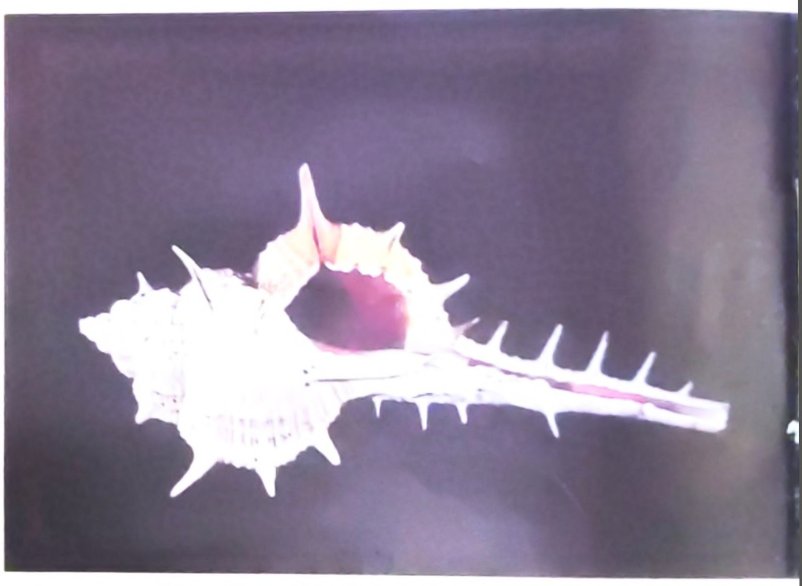


Fig. 117. MUREX TRAPA (Roeding)

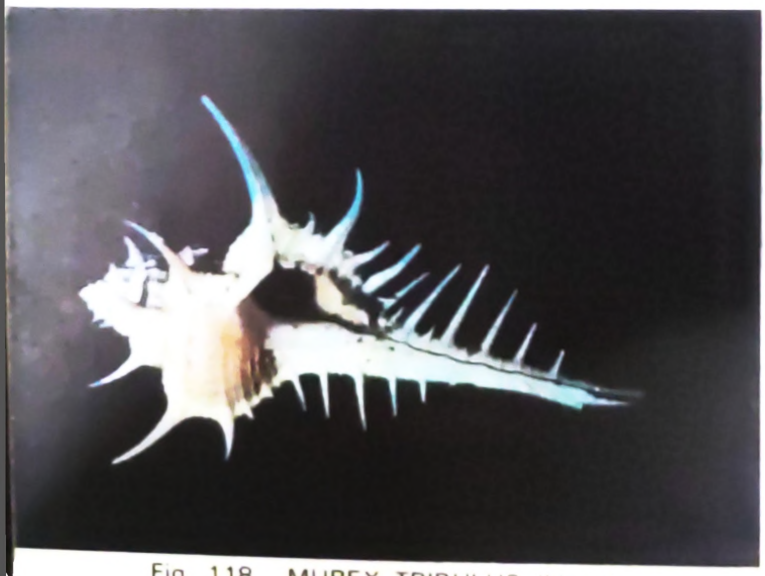


Fig. 118. MUREX TRIBULUS (Linne)

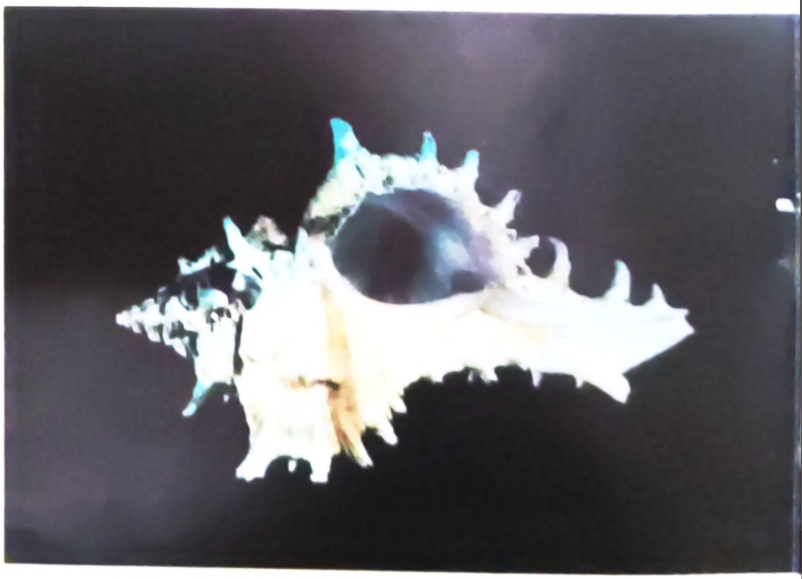


Fig. 119. MUREX VIRGINEUS (Roeding)

Fig. 120. MUREX VIRGINEUS PONDEROSA (Sowerby)

Fig. 121. PTERINOTUS ALATUS (Roeding)

Fig. 122. CRONIA CONTRACTA (Reeve)

Fig. 123. BEDEVA PAIVAE (Crosse)

Fig. 124. PURPURA RUDOLPHI (Lamarck)

Fig. 125. RAPANA BULBOSA (Solander)

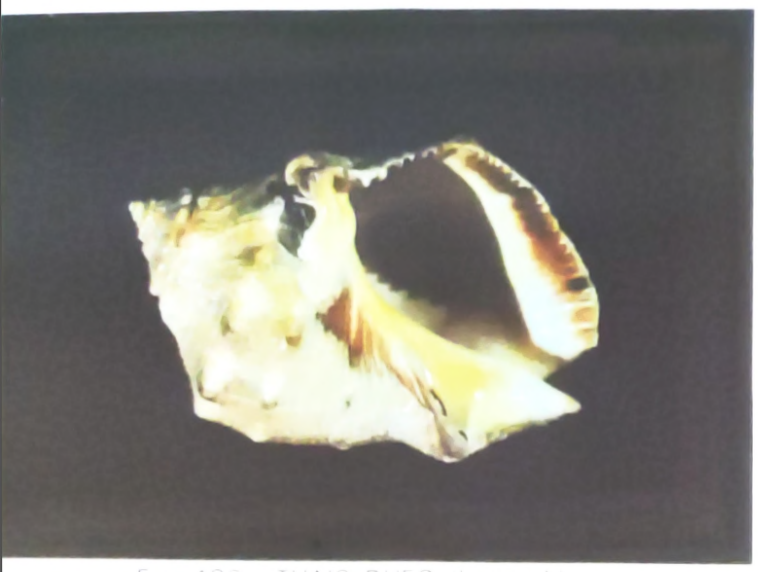


Fig. 126 THAIS BUFO (Lamarck)

Fig. 127 THAIS MUTABILIS (Link)

Fig. 128 THAIS RUGOSA (Born)

Fig. 129 THAIS TISSOTI (Petit)

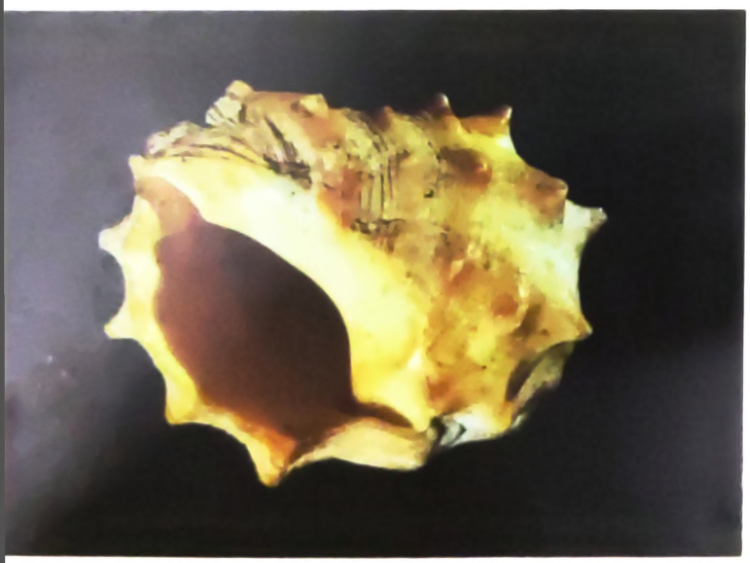


Fig. 130 MANCINELLA ALOUINA (Roeding)

Fig. 131 LATIAXIS Sp.

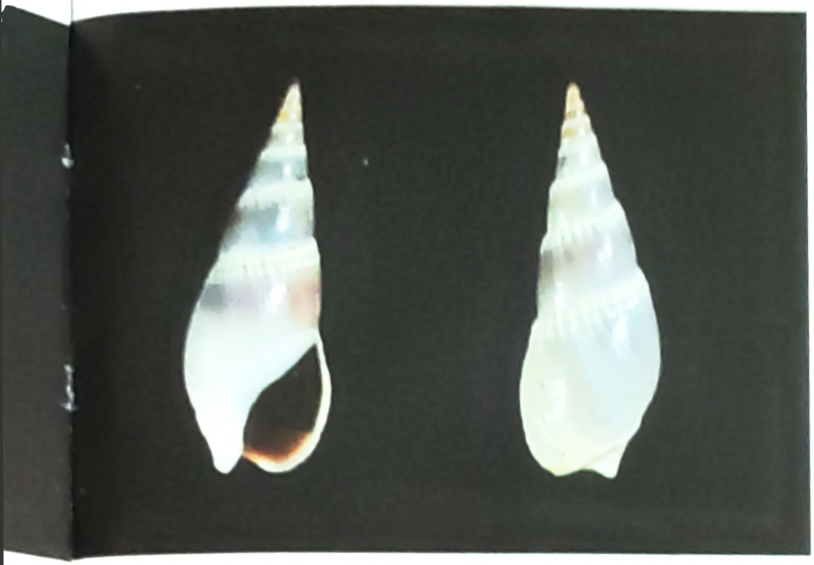


Fig. 132. BULLIA VITTATA (Linne)

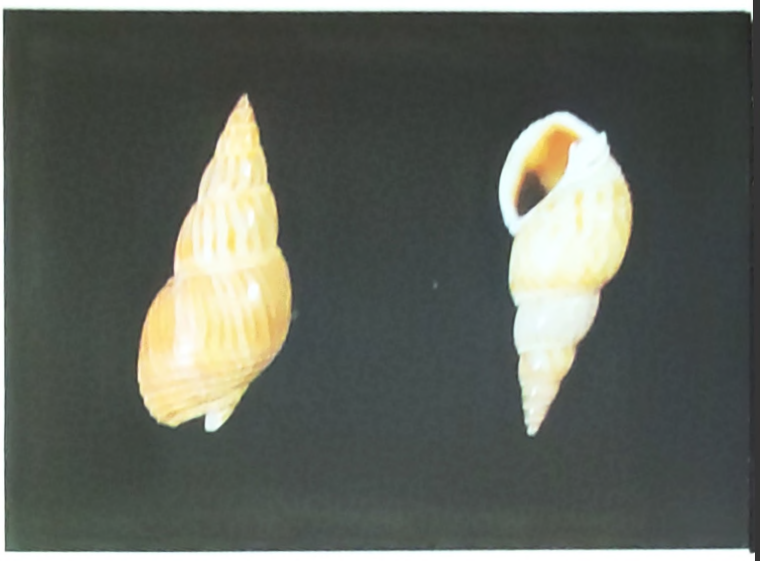


Fig. 133. BULLIA BELANGERI (Kiener)

Fig. 134. NASSARIUS OLIVACEUS (Brugiere)

Fig. 135. NASSARIUS COMPTUS (A. Adams)

Fig. 136. NASSARIUS VARIEGATUS (A. Adams)

Fig. 137. NASSARIUS PULLUS (Linne)

Fig. 138 NASSARIUS STOLATUS (Gmelin)

Fig. 139 NASSARIUS NOVAEZELANDIAE (Reeve)

Fig. 140 NASSA HEPATICA (Montague)

Fig. 141 CANTHARUS TRANQUEBARICUS (Gmelin)

Fig. 142 CANTHARUS SPIRALIS (Gray)

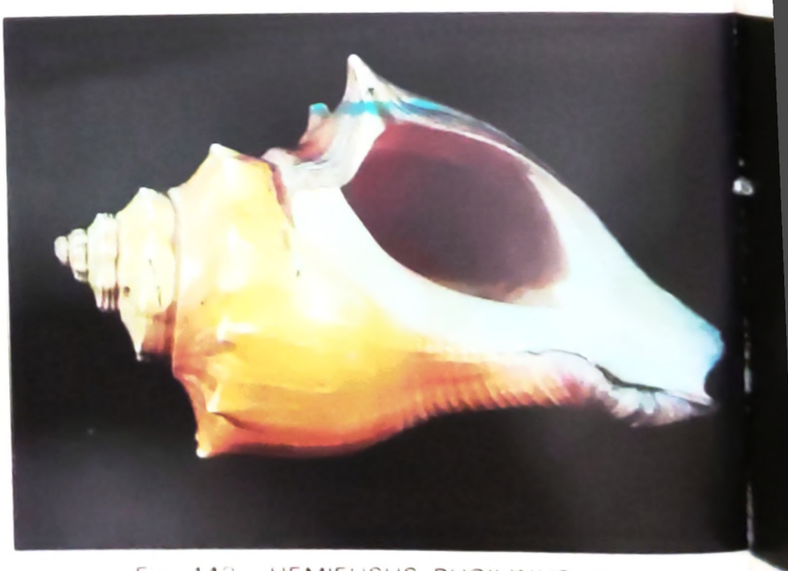


Fig. 143 HEMIFUSUS PUGILINUS (Born)

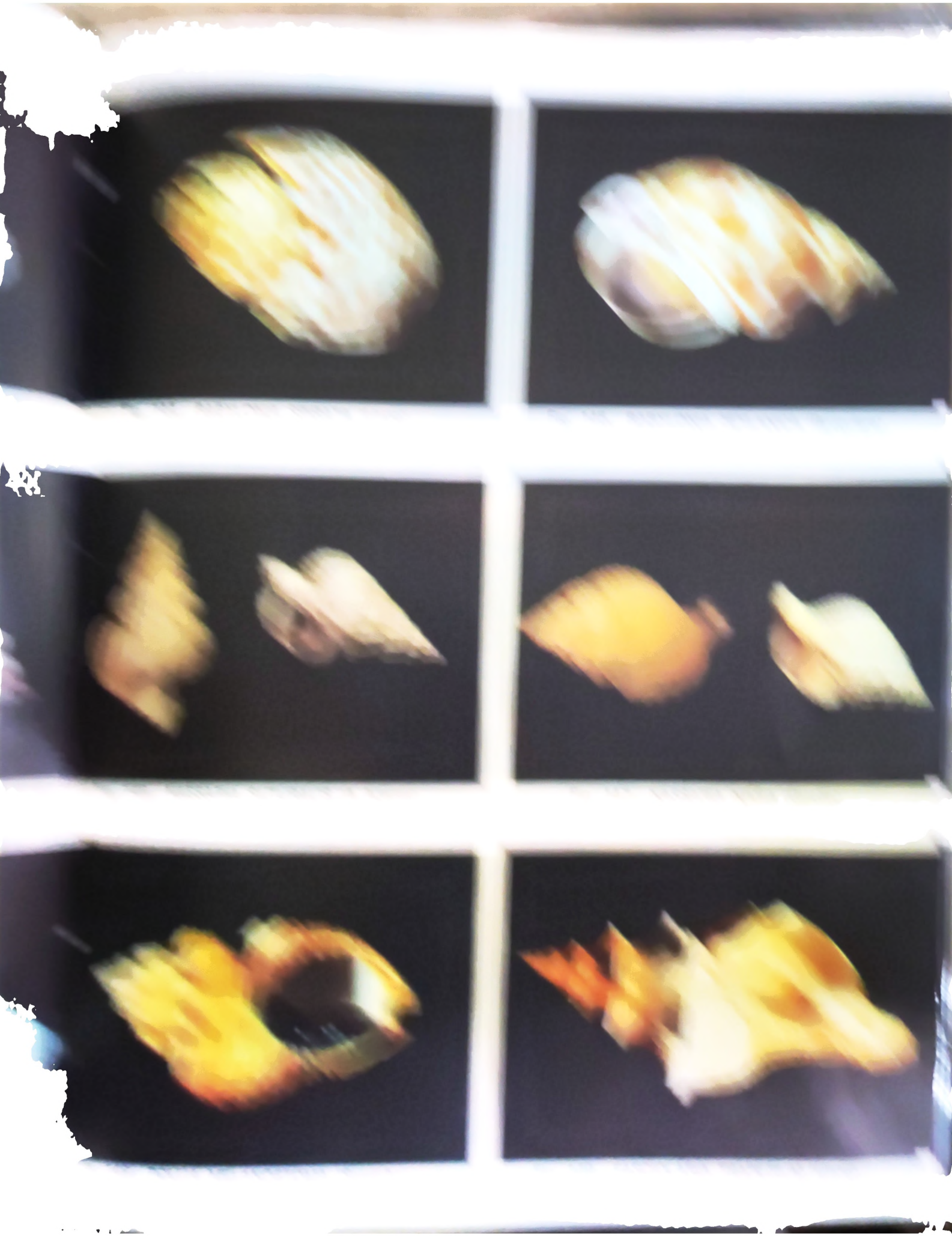


Fig. 150 LATIRUS NASSOIDES (Reeve)

Fig. 151 FUSINUS LONGICAUDUS (Lamarck)

Fig. 152 OLIVA OLIVA (Linne)

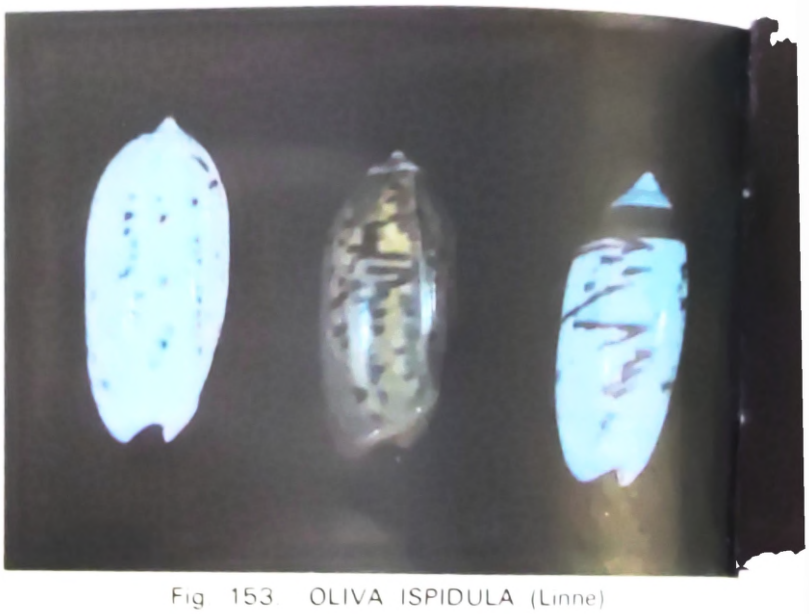


Fig. 153 OLIVA ISPIDULA (Linne)

Fig. 156 OLIVANCILLARIA STEERIA (Reeve)

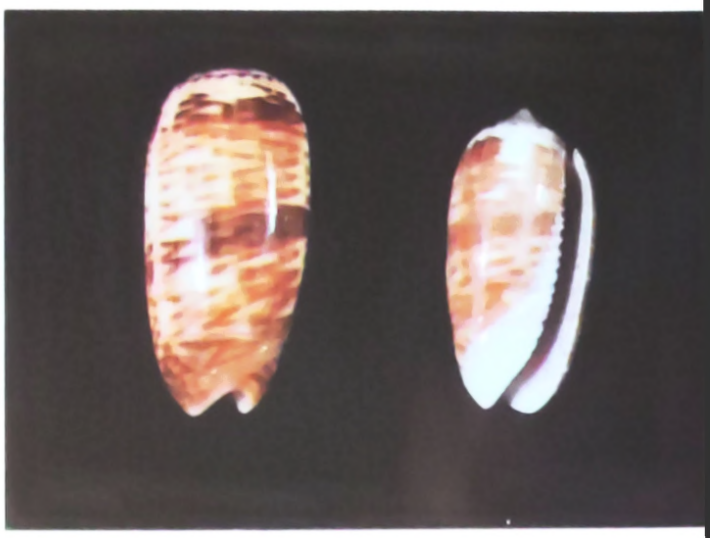


Fig. 157 OLIVA VIDUA (Roeding)

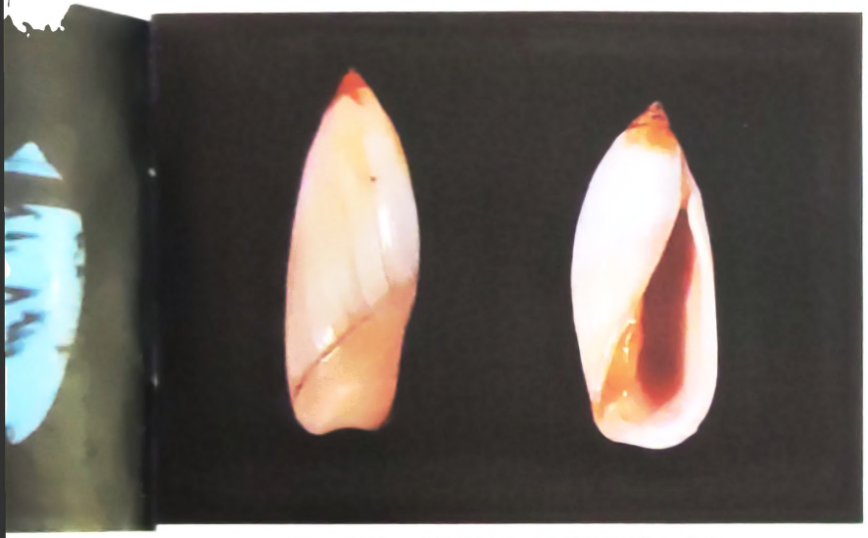


Fig. 158 ANCILLA AMPLA (Gmelin)

Fig. 159 TUDICLA SPIRILLUS (Linne)

Fig. 160 TURBINELLA PYRUM (Linne)

Fig. 161 HARPA CONOIDALIS (Lamarck)

Fig. 162. HARPA Sp.

Fig. 163. MITRA GUTTATA (Swainson)

Fig. 164. MITRA AMBIGUA (Swainson)

Fig. 165. PTERYGIA CRENULATA

Fig. 168. NEOCANCILLA CLATHRUS (Gmelin)

Fig. 169. VEXILLUM REGINA (Sowerby)

Fig. 170. VEXILLUM CREBRILIRATUM (Reeve)

Fig. 171. HARPULINA ARAUSIACA (Lightfoot)

Fig. 172. HARPULINA LOROISII (Valenciennes)

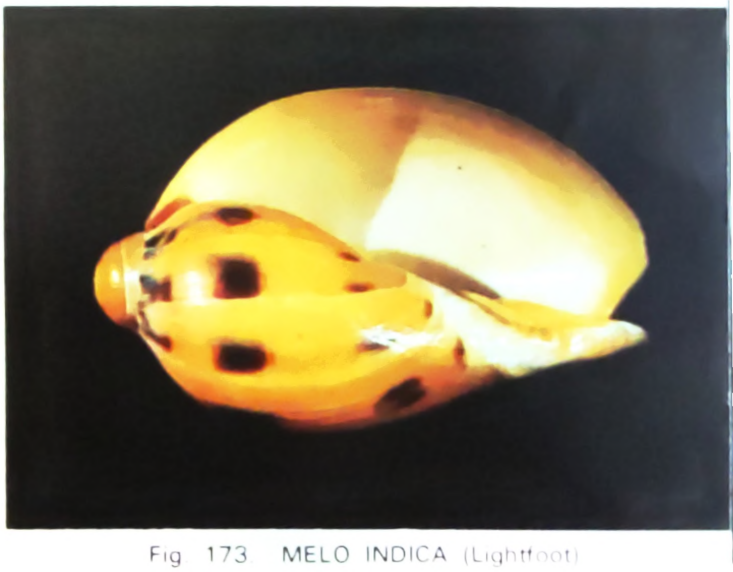


Fig. 173. MELO INDICA (Lightfoot)

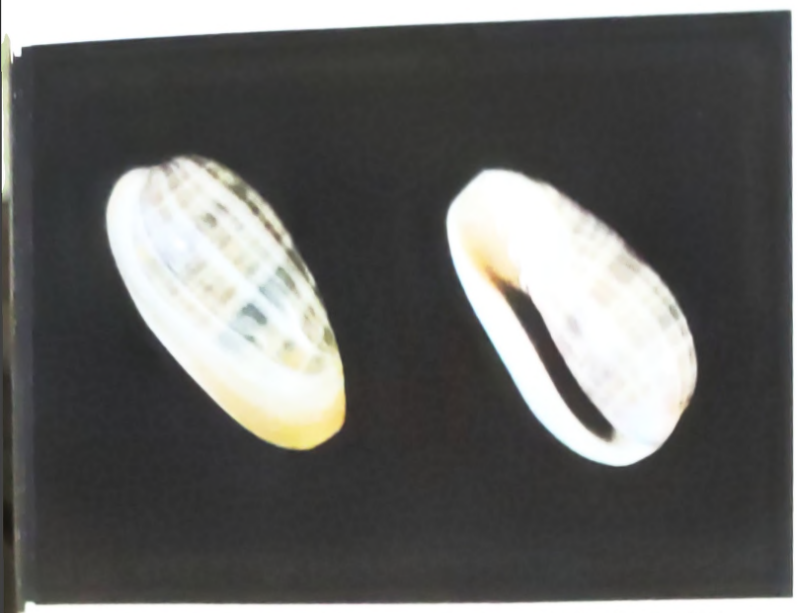


Fig. 174. MARGINELLA ANGUSTATA (Sowerby)

Fig. 175. MARGINELLA LOEBECKEANA (Weinkauff)

Fig. 176. CANCELLARIA LAMBERTI (Sowerby)

Fig. 177. CANCELLARIA ASPERELLA (Lamarck)

5. CANCELLARIA OBLONGA (Sowerby)

Fig. 179. CONUS AMADIS (Gmelin)

Fig. 180 CONUS FIGULINUS (Linne)

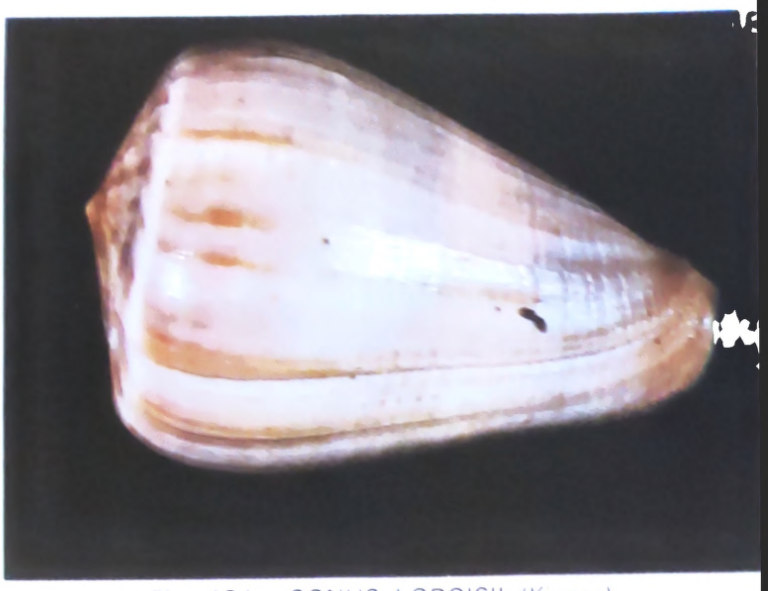


Fig. 181. CONUS LOROISII (Kiener)

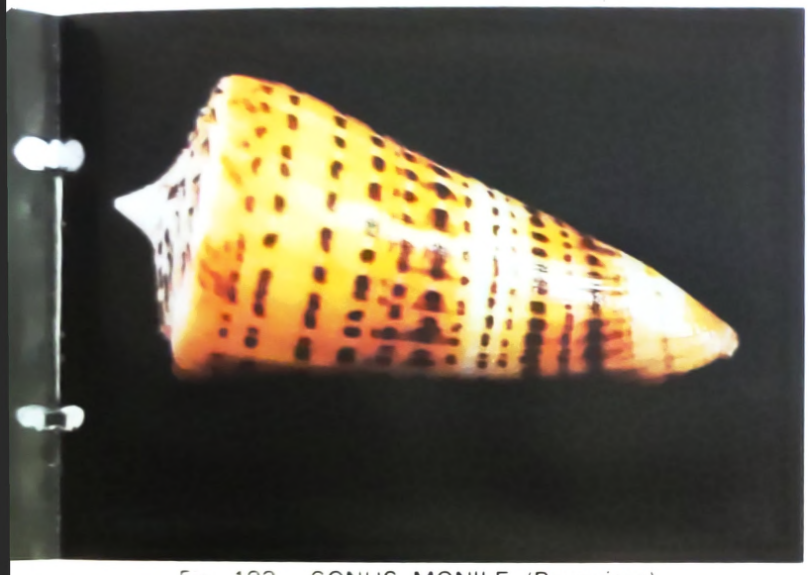


Fig. 182 CONUS MONILE (Bruguiere)

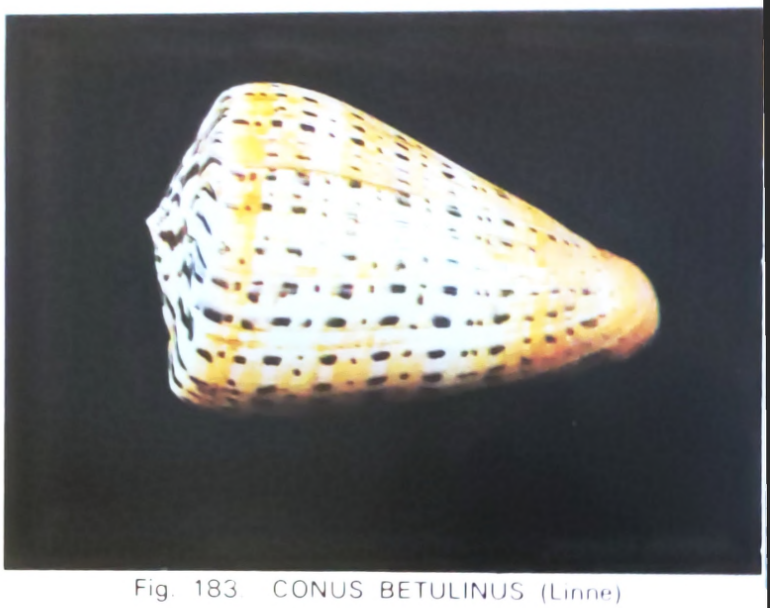


Fig. 183. CONUS BETULINUS (Linne)

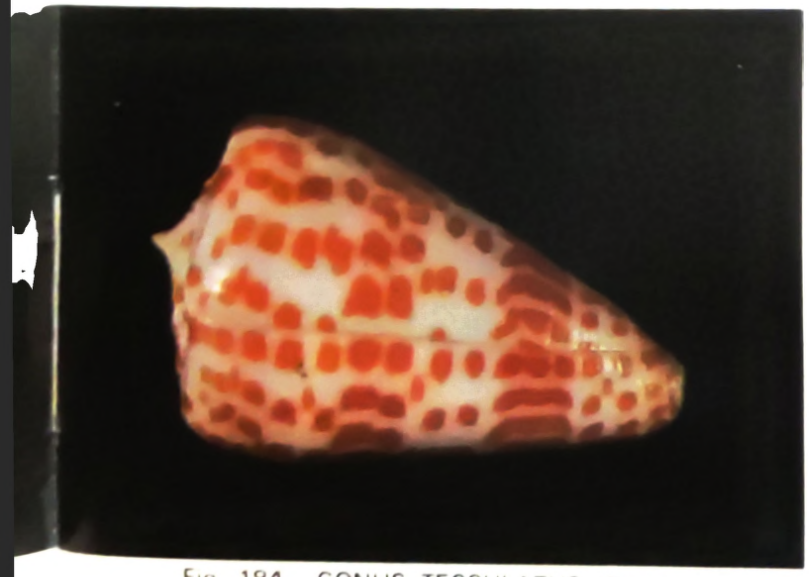


Fig. 184 CONUS TESSULATUS (Born)

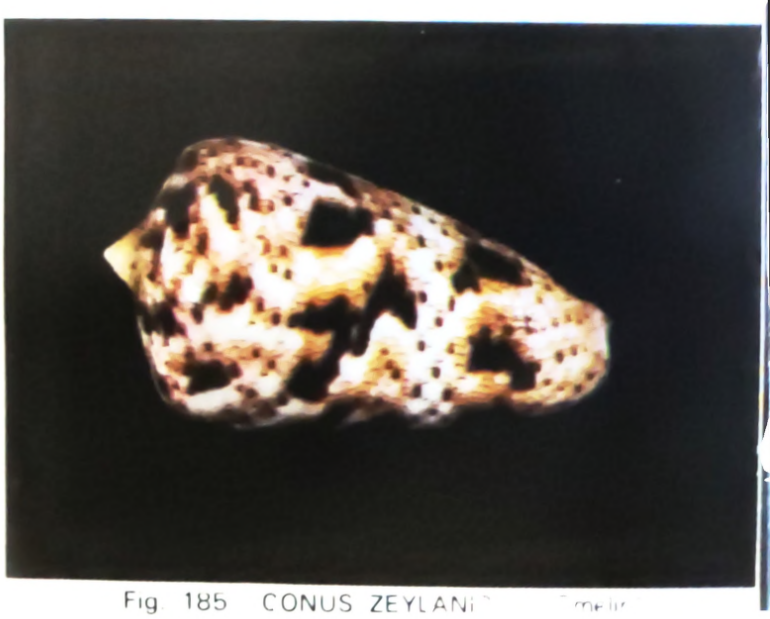


Fig. 185 CONUS ZEYLANI[illegible]

Fig. 186. CONUS TEXTILE (Linne)

Fig. 187. CONUS CARACTERISTICUS (G. Fisher)

Fig. 188. CONUS MALACANUS

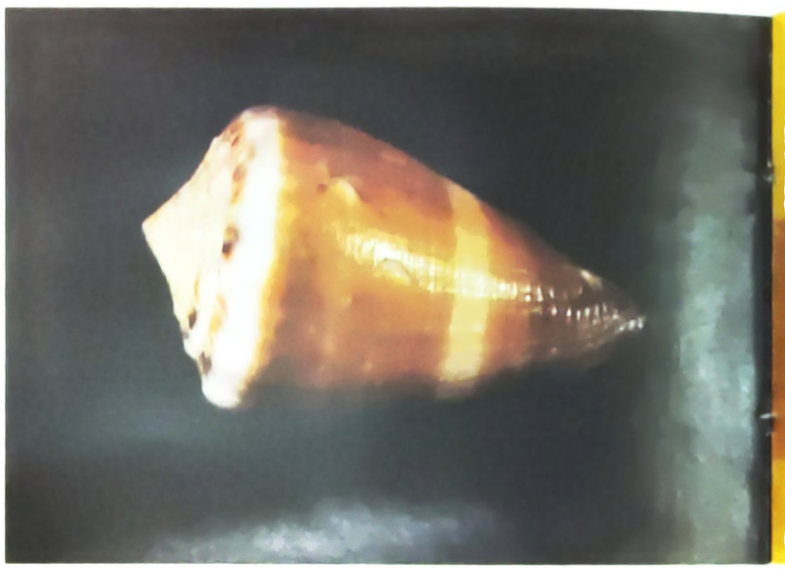


Fig. 189. CONUS LIVIDUS (Hwass)

Fig. 192 CONUS ACULEIFORMIS

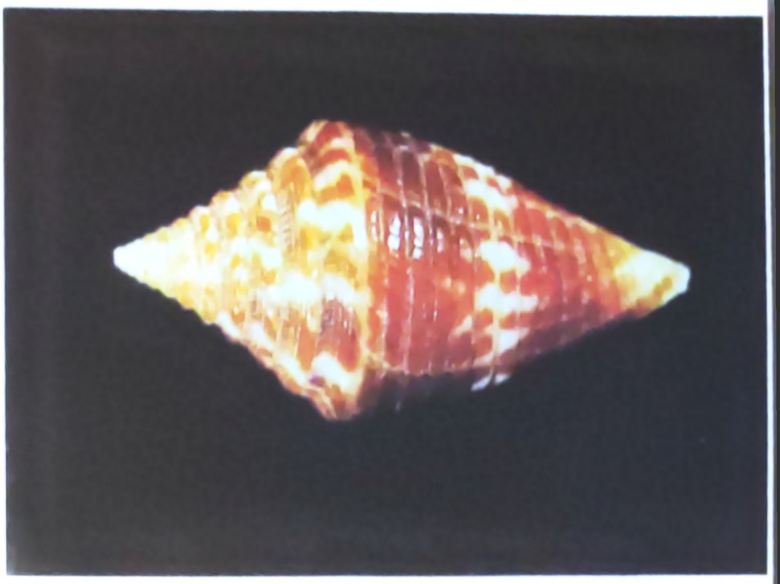


Fig. 193. CONUS ACUTANGULUS

Fig. 194 CONUS GENERALIS (Linne)

Fig. 195. CONUS INSCRIPTUS

Fig. 196 CONUS GEOGRAPHUS (Linne)

Fig. 197 TEREBRA COMMACULATA (Gmelin)

Fig. 198. TEREBRA BABYLONIA (Lamarck)

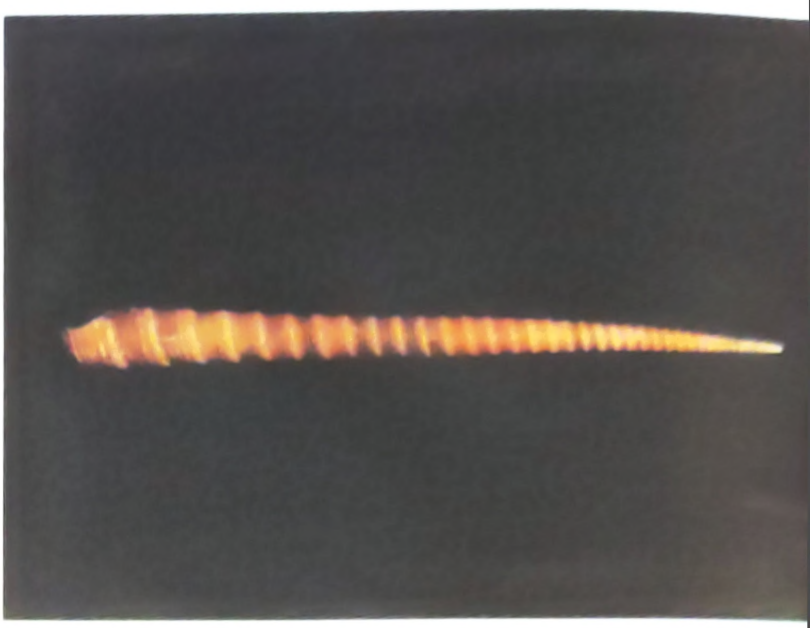


Fig. 199. TEREBRA TRISERIATA (Gray)

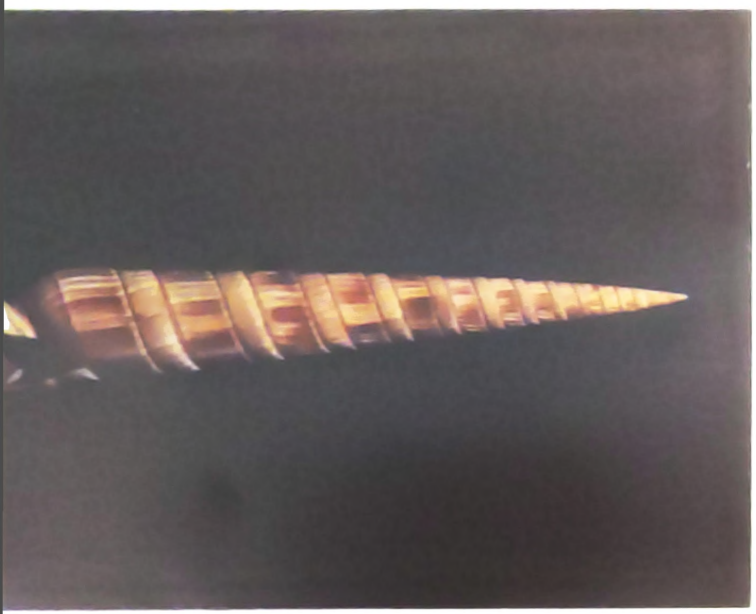


Fig. 200. DUPLICARIA DUPLICATA (Linne)

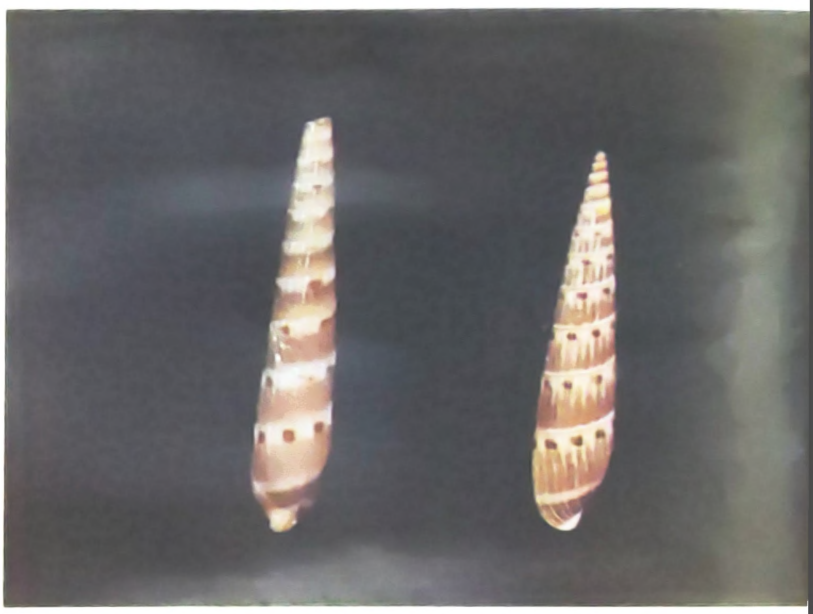


Fig. 201. HASTULA STRIGILATA

Fig. 198 TEREBRA BABYLONIA (Lamarck)

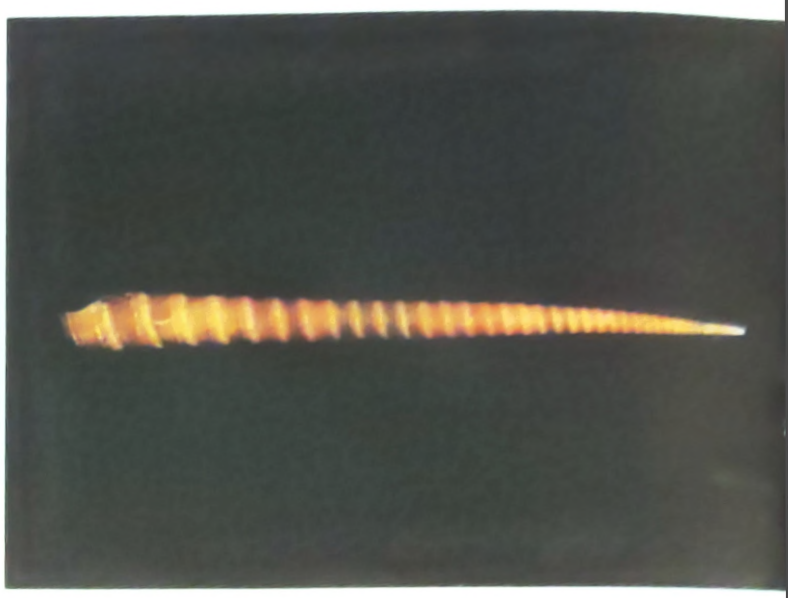


Fig. 199 TEREBRA TRISERIATA (Gray)

Fig. 200 DUPLICARIA DUPLICATA (Linne)

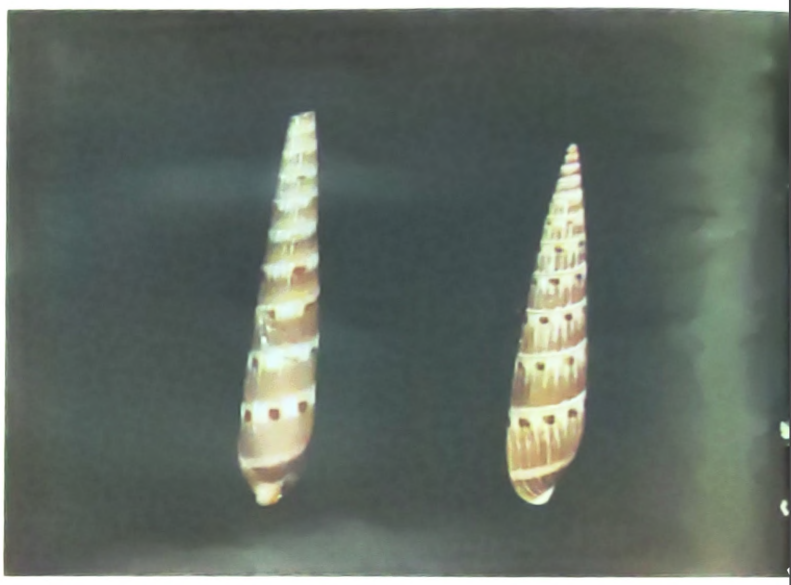


Fig. 201 HASTULA STRIGILATA

Fig. 202 DUPLICARIA RAPHANULA (Lamarck)

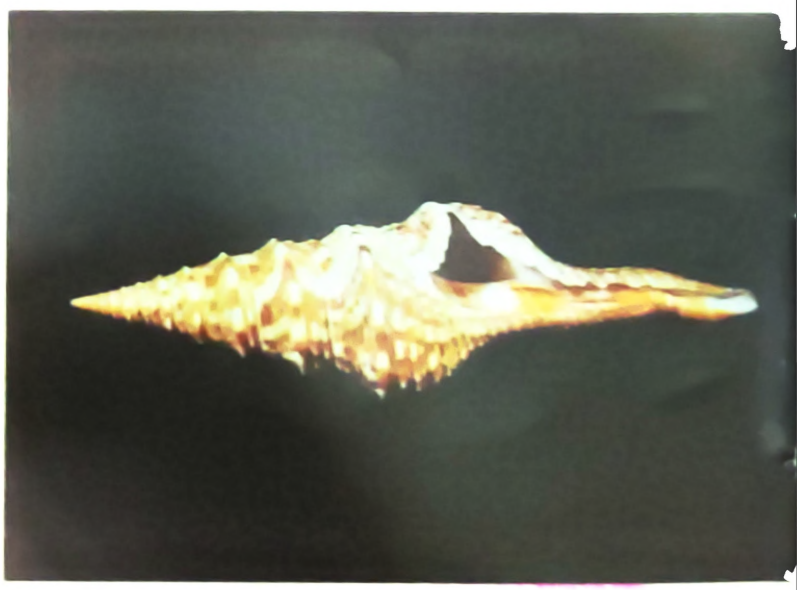


Fig 203 TURRIS INDICA

Fig.204 TURRIS VARIEGATA

Fig. 205 TURRIS NELLIAE

Fig. 206 TURRICULA JAVANA (Linne)

Fig. 207. TURRICULA TORNATA

Fig. 208 BRACHYTOMA CRENULARIS (Lamarck)

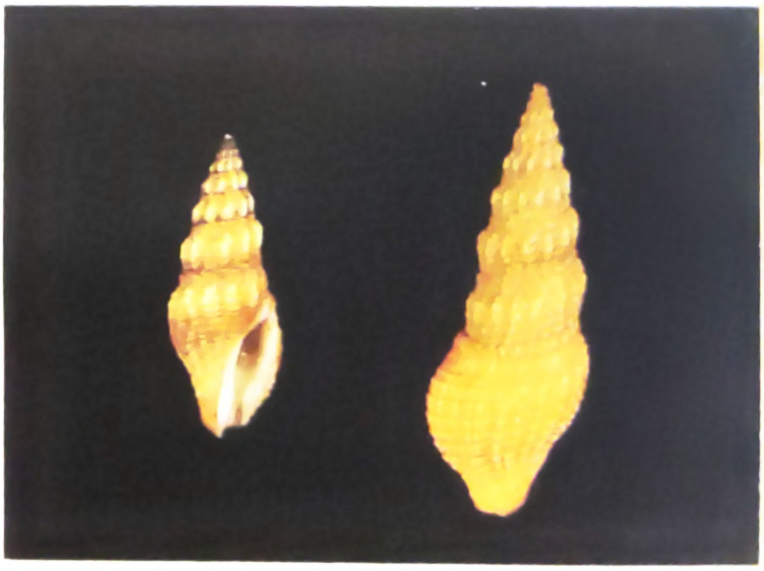


Fig. 209 DRILLIA SACRA (Reeve)

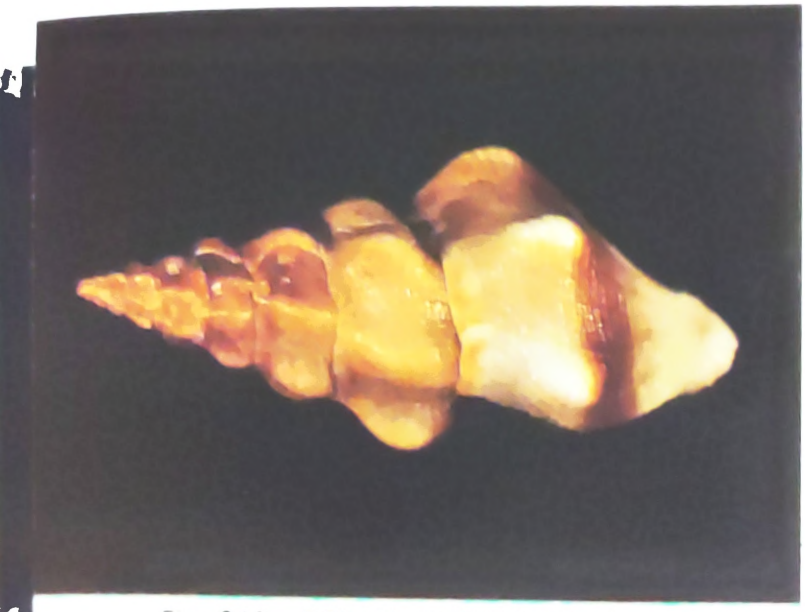


Fig. 210. DRILLIA UMBILICATA (Gray)

Fig. 211. HYDATINA VELUM (Gmelin)

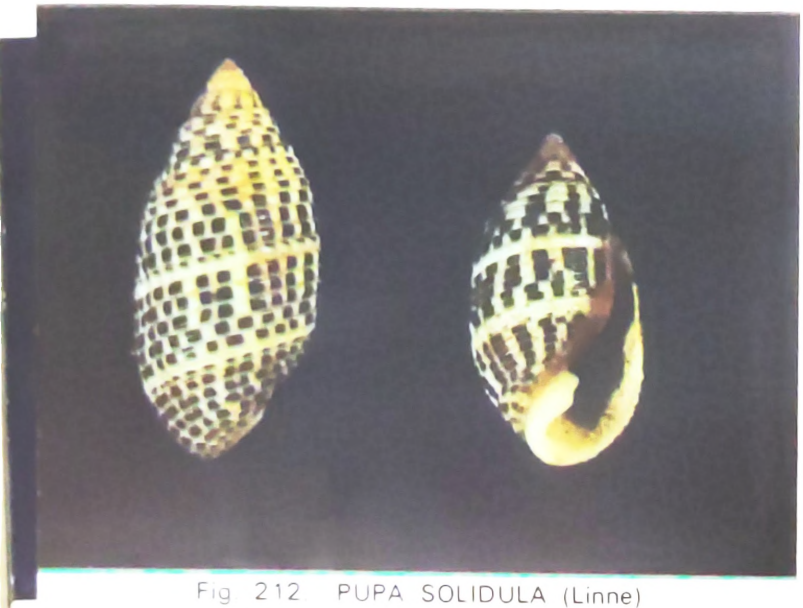


Fig. 212. PUPA SOLIDULA (Linne)

Fig. 213. BULLA AMPULLA (Linne)

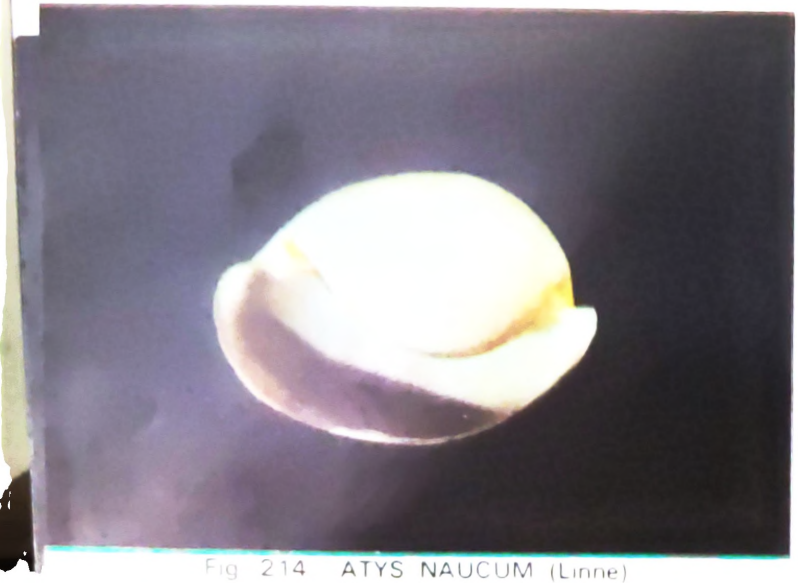


Fig. 214. ATYS NAUCUM (Linne)

Fig. 215. PHILINE ORIENTALIS

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PONDICHERRY GASTROPODS

in their Scientific order

Class : GASTROPODA
Subclass : PROSOBRANCHIA
Order : ARCHAEOGASTROPODA

Superfamily : PATELLACEA
(True Limpets)
Family : PATELLIDAE (Limpets)
CELLANA RADIATA (Born)

Superfamily : TROCHACEA (Top shells)

Family : TROCHIDAE (Top shells)

CALLIOSTOMA TRANQUEBARICA
(Roeding)
EUCHELLUS ASPER (Gmelin)
EUCHELUS ANTRATUS (Gmelin)
EUCHELUS QUADRICARINATUS (Holten)
TROCHUS RADIATUS (Gmelin)
UMBONIUM VESTIARIUM (Linne)

Family : TURBINIDAE (Turban shells)

TURBO INTERCOSTALIS (Menke)

Superfamily : NERITACEA (Nerites)

Family : NERITIDAE

NERITA ALBICILLA (Linne)
NERITA CHAMAELEON (Linne)
NERITA MAURA (Recluz)
NERITA POLITA (Linne)
NERITA SP.

Order : CAENOGASTROPODA

Superfamily : CERITHIACEA

Family : TURRITELLIDAE (Screw shells)

TURRITELLA ATTENUATA (Reeve)
TURRITELLA COLUMNARIS (Kiener)
TURRITELLA DUPLICATA (Lamarck)

Family : ARCHITECTONICIDAE (Sundials)

ARCHITECTONICA LAEVIGATA
(Lamarck)
ARCHITECTONICA PERDIX (Hinds)
ARCHITECTONICA PERSPECTIVA (Linne)
ARCHITECTONICA PURPURATA (Hinds)
ARCHITECTONICA
ARCHITECTONICA
ARCHITECTONICA
ARCHITECTONICA
HELIACUS STRAMINEUS (Gmelin)

Family : POTAMIDIDAE (Horn shells)

CERITHIDEA CINGULATA (Gmelin)
TELESCOPIUM TELESCOPIUM (Ginne)
TEREBRALIA PALUSTRIS (Linne)

Superfamily : EULIMACEA
(Parasitic snails)

Family : EULIMIDAE

BALCIS MARTINII A.Adams

Superfamily : EPITONIACEA (Wentletraps)

Family : EPITONIIDAE

EPITONIUM LAMELLOSUM (Lamarck)
EPITONIUM SCALARE (Linne)

Family : JANTHINIDAE (Violet snails)

JANTHINA GLOBOSA (Swainson)
JANTHINA JANTHINA (Linne)

Superfamily : CALYPTRAEACEA

Family : CALYPTRAEIDAE
(Slipper Limpets)

CREPIDULA WALSHI (Hermannson)
CRUCIBULUM EXTINCTORUM (Lamarck)

Family : XENOPHORIDAE (Carrier shells)

XENOPHORA CORRUGATA (Reeve)
ONUSTUS HELVACEA (Phillipi)
STELLARIA SOLARIS (Linne)

Superfamily : STROMBACEA

Family : STROMBIDAE (Wing shells)

TIBIA INSULAE – CHORAB form CURTA
(Sowerby)
STROMBUS AURIS – DIANAE
STROMBUS LISTERI (Gray)

STROMBUS MARGINATUS (Linne)
STROMBUS MARGINATUS Var.
SUCCINCTUS (Linne)
STROMBUS PLICATUS SIBBALDI
(Sowerby)
STROMBUS MUTABILIS (Swainson)
VARICOSPIRA CANCELLATA (Lamarck)
LAMBIS ARTHRITICA (Roeding)
TEREBELLUM TEREBELLUM (Linne)

Superfamily : NATICACEA (Moon shells)

Family : NATICIDAE

NATICA ALAPAPILIONIS (Roeding)
NATICA ALBULA (Roeding)
NATICA ARACHNOIDEA (Gmelin)
NATICA DIDYMA (Roeding)
NATICA LINEATA (Roeding)
NATICA GUALTERIANA (Recluz)
NATICA PICTA (EUZONA) (Recluz)
NATICA PULICARIS PHILLIPI
NATICA TIGRINA (Roeding)
POLINICES ALBUMEN (Linne)
POLINICES MAMILLA (Linne)
POLINICES MELANOSTOMUS (Gmelin)
POLINICES MELNOSTOMOIDES
(Sebae Recluz)
POLINICES PES – ELEPHANT (Link)
POLINICES TUMIDUS (Swainson)
POLINICES Sp.
SINUM CUVIERIANUM
SINUM DELESSERTII
SINUM JAVANICUM (Griffith & Pidgeon)
SINUM NERITOIDEUM (Linne)
SINUM PLANULATUM (Recluz)

Superfamily : CYPRAEACEA

Family : CYPRAEIDAE (Cowries)

CYPRAEA ARABICA (Linne)
CYPRAEA CARNEOLA (Linne)
CYPRAEA CAURICA (Linne)
CYPRAEA EROSA (Linne)
CYPRAEA HISTRIO (Gmelin)
CYPRAEA LAMARCKI (Gray)
CYPRAEA MAPPA (Linne)
CYPRAEA MONETA (Linne)
CYPRAEA NIVOSA (Broderip)
CYPRAEA OCELLATA (Linne)
CYPRAEA ONYX (Linne)
CYPRAEA PALLIDA (Gray)
CYPRAEA STOLIDA (Linne)

Family : OVULIDAE

VOLVA SOWERBYANA (Weinkauff)
VOLVA VOLVA (Linne)

Superfamily : TONNACEA

Family : CASSIDAE (Helmet Shells)

CASSIS CORNUTA (Linne)
PHALIUM AREOLA (Linne)
PHALIUM BISULCATUM
(Schubert & Wagner)
PHALIUM CANALICULATUM (Bruguiere)
PHALIUM GLAUCUM (Linne)
CASMARIA ERINACEUS
ERINACEUS VIBEX (Linne)
CASMARIA PONDEROSA
PONDEROSA (Gmelin)

Family : FICIDAE (Fig Shells)

FICUS FICOIDES (Lamarck)
FICUS FICUS (Linne)
FICUS GRACILLIS (Sowerby)
FICUS SUBINTERMEDIUS

Family : TONNIDAE (Tun Shells)

TONNA CUMINGII (Reeve)
TONNA DOLIUM (Linne)
TONNA GALEA (Linne)

Family : CYMATIIDAE
(Hairy Tritons)

CYMATIUM CINGULATUM (Lamarck)
CYMATIUM MURICINUM (Roeding)
CYMATIUM PILEARE (Linne)
CYMATIUM (Ranularia) PYRUM
(Linne)
CYMATIUM (Ranularia) RETUSA
(Lamarck)
CYMATIUM RHINOCEROS (Linne)
CYMATIUM SINENSE (Reeve)
CYMATIUM TRIPUS (Lamarck)
GYRINEUM NATATOR (Roeding)
BIPLEX TUBERCULARIS (Lamarck)
DISTORSIO RETICULATA (Roeding)

Family : BURSIDAE (Frog Shells)

BURSA BUFO (Roeding)
BURSA CRUMENA (CRUMENOIDES)
BURSA ECHINATA (Link)
BURSA GRANULARIS (Roeding)
BURSA MARGARITULA (Deshayes)
BURSA RANA (Linne)

BURSA RUBETA (Linne)
BURSA SPINOSA (Lamarck)

Order : NEOGASTROPODA

Superfamily : MURICACEA

Family : MURICIDAE

MUREX PECTEN (Lightfoot)
MUREX TRAPA (Roeding)
MUREX TRIBULUS (Linne)
MUREX VIRGINEUS (Roeding)
MUREX VIRGINEUS *Var.*
PONDEROSA (Sowerby)
HAUSTELLUM HAUSTELLUM (Linne)
CHICOREUS ACULEATUS (Lamarck)
CHICOREUS ADUSTUS (Lamarck)
CHICOREUS ROSSITERI (Crosse)
CHICOREUS RAMOSUS (Linne)
PTERYNOTUS ALATUS (Roeding)
BEDEVA PAIVAE (Crosse)
CRONICA CONTRACTA (Reeve)

Family : THAIDIDAE (Rock Shells)

THAIS BUFO (Lamarck)
THAIS MUTABILIS (Links)
THAIS RUGOSA (Born)
THAIS TISSOTI (Petit)
MANCINELLA ALOUINIA (Roeding)
PURPURA RUDOLPHI (Lamarck)
NASSA HEPATICA (Montagu)
RAPANA BULBOSA (Solander)

Family : Magilidae
(Coral or Pagoda Shells)

LATIAXIS (Sp.)

Superfamily : BUCCINICEA

Family : NASSARIIDAE
(Dog Whelks)
BULLIA BELANGERI (Kiener)
BULLIA VITTATA (Linne)
ZEUXIS OLIVACEUS (Brugiere)
NASSARIUS (ZEUXIS) COMPTUS
(A. Adams)
NASSARIUS NOVAEZELANDIAE (Reeve)
NASSARIUS PULLUS (Linne)
NASSARIUS STOLATUS (GMELIN)
NASSARIUS VARIEGATUS (A. Adams)

Family : BUCCINIDAE (Whelks)

CANTHARUS SPIRALIS (Gray)
CANTHARUS TRANQUEBARICUS (Gmelin)
HEMIFUSUS PUGILINUS (Born)
BABYLONIA SPIRATA (Linne)
BABYLONIA ZEYLANICA (Bruguiere)
NASSARIA NIVEA (Gmelin)
NASSARIA SUTURALIS (A. Adams)
POLLIA MELANOSTOMA (Sowerby)

Family : FASCIOLARIIDAE
Tulip shells)

FASCIOLARIA TRAPEZIUM (Linne)
LATIRUS NASSOIDES (Reeve)
FUSINUS LONGICAUDUS (Lamarck)

Superfamily : VOLUTACEA

Family : OLIVIDAE (Olives)

OLIVA FUNNERRALIS (Lamarck)
OLIVA ISPIDULA (Linne) (Syn. Oliva)
OLIVA OLIVA (Linne)
OLIVA SERICEA (Roeding)
OLIVA TEXTILINA (Lamarck)
OLIVA VIDUA (Roeding)
ANCILLA AMPLA (Gmelin)
OLIVANCILLARIA GIBBOSA (Born)
OLIVANCILLARIA STEERIAE (Reeve)

Family : VASIDAE (Vase shells)
(Dog Chanks)

TUDICLA SPIRILLUS (Linne)

Family : TURBINELLIDAE (Chanks)

TURBINELLA PYRUM (Linne)

Family : HARPIDAE (Harp shells)

HARPA MAJOR (Conoidalis) (Roeding)
HARPA

Family : MITRIDAE (Mitre shells)

MITRA AMBIGUA (Swainson)
MITRA GUTTATA (Swainson)
NEOCANCILLA CLATHRUS (Gmelin)
NEOCANCILLA GRANATINA (Lamarck)
VEXILLUM CREBRILLRATUM (Reeve)
VEXILLUM REGINA (Sowerby)
CANCILLA INSCULPTA
CANCILLA PRAESTANTISSIMA (Roeding)
PTERYGIA CRENULATA (Gmelin)

Family : VOLUTIDAE (Volutes)

MELO INDICA (MELO) (Solander)
HARPULINA ARAUSIACA (Lightfoot)
HARPULINA LOROISII (Valenciennes)

Family : MARGINELLIDAE (Margin shells)

MARGINELLA ANGUSTATA (Sowerby)
MARGINELLA LOEBECKEANA (Weinkauff)

Superfamily : CONACEA

Family : CANCELLARIIDAE (Nutmeg shells)
CANCELLARIA ASPERELLA (Lamarck)
CANCELLARIA LAMBERTI (Sowerby)
CANCELLARIA OBLONGA (Sowerby)

Family : CONIDAE (Cones)

CONUS ACULEIFORMIS (Reeve)
CONUS ACUTANGULUS
CONUS AMADIS (Gmelin)
CONUS BETULINUS (Linne)
CONUS CARACTERISTICUS (G. Fischer)
CONUS FIGULINUS (Linne)
CONUS GENERALIS (Linne)
CONUS GEOGRAPHUS (Linne)
CONUS INSCRIPTUS (Reeve)
CONUS LIVIDUS (Hwass)
CONUS LOROISII (Kiener)
CONUS MALACANUS
CONUS MONILE (Hwass)
CONUS TESSULATUS (Born)
CONUS TEXTILE (Linne)
CONUS ZEYLANICUS (Gmelin)

Family : TEREBRIDAE (Auger shells)
TEREBRA BABYLONIA (Lamarck)
TEREBRA COMMACULATA (Gmelin)
TEREBRA STRIGILATA (Hastula Str.)
TEREBRA TRISERIATA (Gray)

DUPLICARIA DUPLICATA (Linne)
DUPLICARIA RAPHANULA (Lamarck)

Family : TURRIDAE (Turret shells)

TURRIS GARNINSII (Reeve)
TURRIS NELLIAE
TURRIS TORNATA (Dillwyn)
TURRIS VARIEGATA
LOPHIOTOMA INDICA (Roeding)
(Lophiotoma)
TURRICULA JAVANA (Linne)
DRILLIA SACRA (Reeve)
DRILLIA UMBILICATA (Gray)
BRACHYTOMA CRENULARIS
(Lamarck)

Superfamily : ACTEONACEA

Family : HYDATINIDAE
HYDATINA VELUM (Gmelin)

Family : ACTEONIDAE
PUPA SOLIDULA (Linne)

Superfamily : PHILINACEA

Family : PHILINIDAE
PHILINE ORIENTALIS

Superfamily : BULLACEA

Family : ATYIDAE
ATYS NAUCUM (Linne)

Family : BULLIDAE
BULLA AMPULLA (Linne)

PONDICHERRY GASTROPODS

CHECK LIST

GASTROPODS (1)	*SUPERFAMILY* (2)	*FAMILY* (3)	*Page No.* (4)
Ancilla Ampla (Gmelin)	Volutacea	Olividae	86
Architectonica Laevigata (Lamarck)	Cerithiacea	Architectonicidae	16
Architectonica Perdix (Hinds)	Cerithiacea	Architectonicidae	16
Architectonica Perspectiva (Linne)	Cerithiacea	Architectonicidae	15
Architectonica Purpurata (Hinds)	Cerithiacea	Architectonicidae	16
Atys Naucum (Linne)	Bullacea	Atyidae	115
Babylonia Spirata (Linne)	Buccinacea	Buccinidae	80
Babylonia Zeylanica (Bruguiere)	Buccinacea	Buccinidae	80
Balcis Martinii (A. Adams)	Eulimacea	Eulimidae	20
Bedeva Paivae (Crosse)	Muricacea	Muricidae	70
Biplex Bitubercularis (Lamarck)	Tonnacea	Cymatiidae	60
Brachytoma Crenularis (Lamarck)	Conacea	Turridae	112
Bulla Ampulla (Linne)	Bullacea	Bullidae	115
Bullia Belangeri (Kiener)	Buccinacea	Nassariidae	77
Bullia Vittata (Linne)	Buccinacea	Nassariidae	76
Bursa Crumena (Lamarck)	Tonnacea	Bursidae	63
Bursa Granularis (Roeding)	Tonnacea	Bursidae	64
Bursa Margaritula (Deshayes)	Tonnacea	Bursidae	63
Bursa Rana ((Linne)	Tonnacea	Bursidae	63
Bursa Rubeta (Linne)	Tonnacea	Bursidae	64
Bursa Spinosa (Lamarck)	Tonnacea	Bursidae	62
Calliostoma Tranquebarica (Roeding)	Trochacea	Trochidae	9
Cancellaria Asperella (Lamarck)	Conacea	Cancellariidae	103
Cancellaria Lamberti (Sowerby)	Conacea	Cancellariidae	103
Cancellaria Oblonga (Sowerby)	Conacea	Cancellariidae	103
Cantharus Spiralis (Gray)	Buccinacea	Buccinidae	79
Cantharus Tranquebaricus (Gmelin)	Buccinacea	Buccinidae	79
Casmaria Ponderosa (Gmelin)	Tonnacea	Cassididae	51
Casmaria Vibex (Linne)	Tonnacea	Cassididae	52
Cassis Cornuta (Linne)	Tonnacea	Cassididae	49
Cellana Radiata (Born)	Patellacea	Patellidae	7
Cerithiacea Cingulata (Gmelin)	Cerithiacea	Potamididae	18

GASTROPODS (1)	SUPERFAMILY (2)	FAMILY (3)	Page No. (4)
Chicoreus Aculeatus (Lamarck)	Muricacea	Muricidae	66
Chicoreus Adustus (Lamarck)	Muricacea	Muricidae	66
Chicoreus Ramosus (Linne)	Muricacea	Muricidae	66
Chicoreus Rossiteri (Crosse)	Muricacea	Muricidae	66
Conus Aculeiformis (Reeve)	Conacea	Conidae	107
Conus Acutangulus	Conacea	Conidae	107
Conus Amadis (Gmelin)	Conacea	Conidae	105
Conus Betulinus (Linne)	Conacea	Conidae	106
Conus Caracteristicus (G. Fischer)	Conacea	Conidae	106
Conus Figulinus (Linne)	Conacea	Conidae	105
Conus Generalis (Linne)	Conacea	Conidae	107
Conus Geographus (Linne)	Conacea	Conidae	107
Conus Inscriptus (Reeve)	Conacea	Conidae	107
Conus Lividus (Hwass)	Conacea	Conidae	107
Conus Loroissii (Kiener)	Conacea	Conidae	106
Conus Malaccanus	Conacea	Conidae	106
Conus Monile (Bruguire)	Conacea	Conidae	106
Conus Tessulatus (Born)	Conacea	Conidae	106
Conus Textile (Linne)	Conacea	Conidae	106
Conus Zeylanicus (Gmelin)	Conacea	Conidae	106
Crepidula Walshi (Hermannsen)	Calyptraeacea	Calyptraeidae	25
Cronia Contracta (Reeve)	Muricacea	Muricidae	70
Crucibulum Extinctorium (Lamarck)	Calyptraeacea	Calyptraeidae	25
Cymatium Cingulatum (Lamarck)	Tonnacea	Cymatiidae	59
Cymatium Muricinum (Roeding)	Tonnacea	Cymatiidae	60
Cymatium Perryi (Emerson & Old)	Tonnacea	Cymatiidae	57
Cymatium Pileare (Linne)	Tonnacea	Cymatiidae	58
Cymatium (Ranularia) Pyrum (Linne)	Tonnacea	Cymatiidae	59
Cymatium (Ranularia) Retusum (Lamarck)	Tonnacea	Cymatiidae	60
Cymatium Tripus (Lamarck)	Tonnacea	Cymatiidae	59
Cypraea Arabica (Linne)	Cypraeacea	Cypraeidae	45
Cypraea Carneola (Linne)	Cypraeacea	Cypraeidae	46
Cypraea Caurica (Linne)	Cypraeacea	Cypraeidae	45
Cypraea Erosa (Linne)	Cypraeacea	Cypraeidae	46
Cypraea Histrio (Gmelin)	Cypraeacea	Cypraeidae	45
Cypraea Lamarcki (Gray)	Cypraeacea	Cypraeidae	44
Cypraea Mappa (Linne)	Cypraeacea	Cypraeidae	45

GASTROPODS (1)	*SUPERFAMILY* (2)	*FAMILY* (3)	*Page No.* (4)
Cypraea Moneta (Linne)	Cypraeacea	Cypraeidae	46
Cypraea Nivosa (Broderip)	Cypraeacea	Cypraeidae	46
Cypraea Ocellata (Linne)	Cypraeacea	Cypraeidae	44
Cypraea Onyx (Linne)	Cypraeacea	Cypraeidae	44
Cypraea Pallida (Gray)	Cypraeacea	Cypraeidae	46
Cypraea Pulchella (Swainson)	Cypraeacea	Cypraeidae	45
Distorsio Reticulata (Roeding)	Tonnacea	Cymatiidae	61
Drilla Sacra (Reeve)	Conacea	Turridae	113
Drilla Umbilicata (Gray)	Conacea	Turridae	113
Duplicaria Duplicata (Linne)	Conacea	Terebridae	109
Duplicaria Raphanula (Lamarck)	Conacea	Terebridae	110
Epitonium Lamellosum (Lamarck)	Epitoniacea	Epitoniidae	21
Epitonium Scalare (Linne)	Epitoniacea	Epitoniidae	21
Euchelus Asper (Gmelin)	Trochacea	Trochidae	9
Euchelus Atratus (Gmelin)	Trochacea	Trochidae	9
Euchelus Quadricarinatus (Holten)	Trochacea	Trochidae	9
Fasciolaria Trapezium (Linne)	Buccinacea	Fasciolariidae	82
Ficus Ficoides (Lamarck)	Tonnacea	Ficidae	53
Ficus Ficus (Linne)	Tonnacea	Ficidae	54
Ficus Gracilis (Sowerby)	Tonnacea	Ficidae	53
Ficus Subintermedius (D'Orbigny)	Tonnacea	Ficidae	53
Fusinus Longicaudus (Lamarck)	Buccinacea	Fasciolariidae	82
Gyrineum Natator (Roeding)	Tonnacea	Cymatiidae	60
Harpa Conoidalis (Lamarck)	Volutacea	Harpidae	96
Harpulina Arausiaca (Lightfoot)	Volutacea	Volutidae	100
Harpulina Loroissii (Valenciennes)	Volutacea	Volutidae	100
Hastula Strigilata	Conacea	Terebridae	110
Haustellum Haustellum (Linne)	Muricacea	Muricidae	67
Heliacus Stramineus (Gmelin)	Cerithiacea	Architectonicidae	17
Hemifusus Pugilinus (Born)	Buccinacea	Buccinidae	79
Hydatina Velum (Gmelin)	Acteonacea	Hydatinidae	114
Janthina Globosa (Swainson)	Epitoniacea	Janthinidae	24
Janthina Janthina (Linne)	Epitoniacea	Janthinidae	24
Lambis Chiragra Arthritica (Roeding)	Strombacea	Strombidae	31
Latiaxis Sp.	Muricacea	Magilidae	75
Latirus Nassoides (Reeve)	Buccinacea	Fasciolariidae	82
Mancinella Alouina (Roeding)	Muricacea	Thaididae	74
Marginella Angustata (Sowerby)	Volutacea	Marginellidae	102

GASTROPODS (1)	*SUPERFAMILY* (2)	*FAMILY* (3)	*Page No.* (4)
Marginella Loebeckeana (Weinkauff)	Volutacea	Marginellidae	102
Melo Indica (Lightfoot)	Volutacea	Marginellidae	100
Mitra Ambigua (Swainson)	Volutacea	Mitridae	98
Mitra Guttata (Swainson)	Volutacea	Mitridae	98
Murex (Chicoreus) Adustus (Lamarck)	Muricacea	Muricidae	66
Murex Pecten (Lightfoot)	Muricacea	Muricidae	67
Murex Trapa (Roeding)	Muricacea	Muricidae	68
Murex Tribulus (Linne)	Muricacea	Muricidae	69
Murex Virgineus (Roeding)	Muricacea	Muricidae	69
Murex Virgineus *var.* Ponderosa (Sowerby)	Muricacea	Muricidae	69
Nassa Hepatica (Montaqu)	Muricacea	Thaididae	78
Nassaria Nivea (Gmelin)	Buccinacea	Buccinidae	81
Nassarius Olivaceus (Bruguiere)	Buccinacea	Nassariidae	77
Nassaria Suturalis (A. Adams)	Buccinacea	Buccinidae	80
Nassarius (Zeuxis) Comptus (A. Adams)	Buccinacea	Nassariidae	77
Nassarius Novaezelandiae (Reeve)	Buccinacea	Nassariidae	78
Nassarius Pullus (Linne)	Buccinacea	Nassariidae	77
Nassarius Stolatus (Gmelin)	Buccinacea	Nassariidae	78
Nassarius (Niotha) Variegatus (A. Adams)	Buccinacea	Nassariidae	77
Natica Ala-Papilionis (Roeding)	Naticacea	Naticidae	36
Natica Albula (Roeding)	Naticacea	Naticidae	36
Natica Arachnoidea (Gmelin)	Naticacea	Naticidae	37
Natica Didyma (Roeding)	Naticacea	Naticidae	35
Natica Gualteriana (Recluz)	Naticacea	Naticidae	37
Natica Lineata (Lamarck)	Naticacea	Naticidae	36
Natica Picta (Recluz)	Naticacea	Naticidae	37
Natica Pulicaris (Philippi)	Naticacea	Naticidae	37
Natica Tigrina (Roeding)	Naticacea	Naticidae	37
Neocancilla Circula (Kiener)	Volutacea	Mitridae	99
Neocancilla Clathrus (Gmelin)	Volutacea	Mitridae	99
Neocancilla Granatina (Lamarck)	Volutacea	Mitridae	99
Nerita Alibicilla (Linne)	Neritacea	Neritidae	11
Nerita Chamaeleon (Linne)	Neritacea	Neritidae	12
Nerita (Ritena) Maura (Recluz)	Neritacea	Neritidae	12
Nerita Polita (Linne)	Neritacea	Neritidae	12

GASTROPODS (1)	SUPERFAMILY (2)	FAMILY (3)	Page No. (4)
Oliva Ispidula (Linne)	Volutacea	Olividae	85
Oliva Oliva (Linne)	Volutacea	Olividae	85
Oliva Textilina (Lamarck)	Volutacea	Olividae	85
Oliva Vidua (Roeding)	Volutacea	Olividae	86
Olivancillaria Gibbosa (Born)	Volutacea	Olividae	85
Olivancillaria Steeria (Reeve)	Volutacea	Olividae	86
Onustus Helvacea (Philippi)	Calyptraeacea	Xenophoridae	27
Phalium Areola (Linne)	Tonnacea	Cassidae	51
Phalium Bisulcatum (Schubert & Wagner)	Tonnacea	Cassidae	50
Phalium Canaliculatum (Bruguiere)	Tonnacea	Cassidae	51
Phalium Glaucum (Linne)	Tonnacea	Cassidae	50
Philine Orientalis	Philinacea	Philinidae	116
Polinices Albumen (Linne)	Naticacea	Naticidae	37
Polinices Mamilla (Linne)	Naticacea	Naticidae	38
Polinices Melanostomus (Gmelin)	Naticacea	Naticidae	39
Polinices Melanostomoides	Naticacea	Naticidae	39
Polinices Pes-Elephanti (Link)	Naticacea	Naticidae	38
Polinices Tumidus (Swainson)	Naticacea	Naticidae	39
Pollia Melanostoma (Sowerby)	Buccinacea	Buccinidae	81
Pupa Solidula (Linne)	Acteonacea	Acteonidae	115
Purpura Rudolphi (Lamarck)	Muricacea	Thaididae	71
Pterygia Crenulata (Gmelin)	Volutacea	Mitridae	98
Pterynotus Alatus (Roeding)	Muricacea	Muricidae	70
Rapana Bulbosa (Solander)	Muricacea	Muricidae	72
Sinum Cuvierianum	Naticacea	Naticidae	40
Sinum Neritoideum (Linne)	Naticacea	Naticidae	40
Sinum Planulatum (Recluz)	Naticacea	Naticidae	40
Stellaria Solaris (Linne)	Calyptraeacea	Xenophoridae	27
Strombus Auris-Dianae (Linne)	Strombacea	Strombidae	29
Strombus Listeri (Gray)	Strombacea	Strombidae	30
Strombus Marginatus (Linne)	Strombacea	Strombidae	29
Strombus Marginatus Var. Succinctus (Linne)	Strombacea	Strombidae	29
Strombus Mutabilis (Swainson)	Strombacea	Strombidae	29
Strombus Plicatus Pulchellus (Reeve)	Strombacea	Strombidae	29
Telescopium Telescopium (Linne)	Cerithiacea	Potamididae	19
Terebellum Terebellum (Linne)	Strombacea	Strombidae	32

GASTROPODS (1)	SUPERFAMILY (2)	FAMILY (3)	Page N (4)
Terebra Babylonia (Lamarck)	Conacea	Terebridae	109
Terebra Commaculata (Gmelin)	Conacea	Terebridae	109
Terebra Triseriata (Gray)	Conacea	Terebridae	109
Terebral Palustris (Linne)	Cerithiacea	Potamididae	19
Thais Bufo (Lamarck)	Muricacea	Thaididae	72
Thais Mutabilis (Link)	Muricacea	Thaididae	73
Thais Rugosa (Born)	Muricacea	Thaididae	73
Thais Tissoti (Petit)	Muricacea	Thaididae	73
Tibia Insulae-Chorab Curta (Sowerby)	Strombacea	Strombidae	30
Tonna Cumingii (Reeve)	Tonnacea	Tonnidae	56
Tonna Dolium (Linne)	Tonnacea	Tonnidae	55
Tonna Galea (Linne)	Tonnacea	Tonnidae	55
Trochus Radiatus (Gmelin)	Trochacea	Trochidae	8
Tudicla Spirillus (Linne)	Volutacea	Vasidae	87
Turbinella Pyrum (Linne)	Volutacea	Turbinellidae	95
Turbo Intercostalis (Menke)	Trochacea	Turbinidae	10
Turricula Javana (Linne)	Conacea	Turridae	111
Turris Indica	Conacea	Turridae	111
Turris Nelliae	Conacea	Turridae	111
Turricula Tornata	Conacea	Turridae	112
Turris Variegata	Conacea	Turridae	111
Turritella Attenuata (Reeve)	Cerithiacea	Turritellidae	14
Turritella Columnaris (Kiener)	Cerithiacea	Turritellidae	14
Turritella Duplicata (Lamarck)	Cerithiacea	Turritellidae	14
Umbonium Vestiarium (Linne)	Trochacea	Trochidae	8
Varicospira Cancellata (Lamarck)	Strombacea	Strombidae	32
Vexillum Crebriliratum (Reeve)	Volutacea	Mitridae	99
Vexillum Regina (Sowerby)	Volutacea	Mitridae	99
Volva Sowerbyana (Weinkauff)	Cypraeacea	Ovulidae	48
Volva Volva (Linne)	Cypraeacea	Ovulidae	47
Xenophora Corrugata (Reeve)	Calyptraeacea	Xenophoridae	26

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GASTROPODS (1)	SUPERFAMILY (2)	FAMILY (3)	Page N (4)
Terebra Babylonia (Lamarck)	Conacea	Terebridae	109
Terebra Commaculata (Gmelin)	Conacea	Terebridae	109
Terebra Triseriata (Gray)	Conacea	Terebridae	109
Terebral Palustris (Linne)	Cerithiacea	Potamididae	19
Thais Bufo (Lamarck)	Muricacea	Thaididae	72
Thais Mutabilis (Link)	Muricacea	Thaididae	73
Thais Rugosa (Born)	Muricacea	Thaididae	73
Thais Tissoti (Petit)	Muricacea	Thaididae	73
Tibia Insulae-Chorab Curta (Sowerby)	Strombacea	Strombidae	30
Tonna Cumingii (Reeve)	Tonnacea	Tonnidae	56
Tonna Dolium (Linne)	Tonnacea	Tonnidae	55
Tonna Galea (Linne)	Tonnacea	Tonnidae	55
Trochus Radiatus (Gmelin)	Trochacea	Trochidae	8
Tudicla Spirillus (Linne)	Volutacea	Vasidae	87
Turbinella Pyrum (Linne)	Volutacea	Turbinellidae	95
Turbo Intercostalis (Menke)	Trochacea	Turbinidae	10
Turricula Javana (Linne)	Conacea	Turridae	111
Turris Indica	Conacea	Turridae	111
Turris Nelliae	Conacea	Turridae	111
Turricula Tornata	Conacea	Turridae	112
Turris Variegata	Conacea	Turridae	111
Turritella Attenuata (Reeve)	Cerithiacea	Turritellidae	14
Turritella Columnaris (Kiener)	Cerithiacea	Turritellidae	14
Turritella Duplicata (Lamarck)	Cerithiacea	Turritellidae	14
Umbonium Vestiarium (Linne)	Trochacea	Trochidae	8
Varicospira Cancellata (Lamarck)	Strombacea	Strombidae	32
Vexillum Crebriliratum (Reeve)	Volutacea	Mitridae	99
Vexillum Regina (Sowerby)	Volutacea	Mitridae	99
Volva Sowerbyana (Weinkauff)	Cypraeacea	Ovulidae	48
Volva Volva (Linne)	Cypraeacea	Ovulidae	47
Xenophora Corrugata (Reeve)	Calyptraeacea	Xenophoridae	26

Fred Pinn is a School-master and has taught in Europe, Africa and Asia. Many years ago, the gift of an unwanted shell collection roused some slight curiosity in this subject. But then, during a teaching spell in Kenya (1960) he spent all his holidays on the coast exploring the wonders of the reef. He became fascinated with marine biology in general and shells in particular and pursued these interests whilst running a school in Calcutta (1966-71): part of the school's project work included a regular annual visit to Digha (near the Orissa border) for the purpose of a survey of marine life as found on the Digha beach. Other expeditions took him to Ramnad, Killakarai, Pamban, Rameswaram and Krusadai island. The present survey of the sea snails of Pondicherry is a more methodical repeat performance of an effort made in 1973.

The author has also written a children's book on the seashore and a history of the foundation of Darjeeling ("The Road of Destiny").

In the photograph the author is holding the "Glory of India" and the "Glory of Bengal", two of the rarest Indian shells found 25 km south of Pondicherry but likely to turn up there at any time. (*See* also illustrations on book cover).

GLORY OF INDIA
CONUS MILNEDWARDSI
GLORY OF BENGAL
CONUS BENGALENSIS